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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XIV

WITH 42 PLATES

1926

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

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Missouri Botanical Garden Bulletin

Vol. XIV JANUARY, 1926 No. 1

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RAVINE AND BROOK, GRAY'S SUMMIT EXTENSION.

Missouri Botanical Garden Bulletin

Vol. XIV JANUARY, 1926 No. 1

THIRTY-SEVENTH ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the thirty-seventh annual report of the Director.

The year 1925 may be properly regarded as an epoch-making one for the Missouri Botanical Garden. The acquisition of the long-contemplated site for an out-of-town extension would be of itself sufficient to mark the year as a notable one; while the settlement of the two-hundred-foot strip controversy and various other additions or improvements combine to insure the continued usefulness and success of an institution which has in the past made a notable record for service, not only locally, but nationally and throughout the world. The annual reports of the Director are by tradition nothing more than an account of the achievements of the year past, but in view of the record for 1925 it may be permissible, without attempting to prophesy, to indulge in some hopes for the future.

Out-of-town Extension to the Garden.—In the annual reports for the past several years the desirability and necessity of securing an additional location which would provide conditions suitable for the growing of plants, no longer obtainable within the city, has been sufficiently commented upon. Permission having been obtained from the Court to dispose of the unimproved land west of the Garden, and enough lots of this subdivision having been sold to insure a revenue sufficient to provide an out-of-town location without curtailing the revenue available for the maintenance of the original Garden, a careful survey was made of all the pos-

sible locations within a reasonable distance from St. Louis. The requirements for the new extension were exacting, including not only a situation which would lend itself to the growing of every kind of tree and plant hardy in this vicinity, but it was also desirable that there be already represented a sufficiently large proportion of the local flora so that a good start would already have been made towards securing the natural effect desired. In view of the fact that it is contemplated that many of the plants grown at the new location are to be transported for exhibition to the city Garden, it was absolutely necessary that the new site be located on a good road, and many other factors, such as an adequate water supply, isolation from adjoining tracts which ultimately might be developed in a way detrimental to the Garden, variety in soils and topography, presence of building material, such as rock, gravel and sand, reasonable price, etc., all had to be taken into consideration.

After more than a year spent in investigating various properties, a tract was located, near Gray's Summit, aggregating 1300 acres. This consisted of five separate farms, thirty-eight miles from St. Louis on the Manchester Road, and seemed to meet to an unusual degree all requirements. This land is bounded on three sides by public roads and with a frontage of about two miles on the Meramec River, thus being well cut off from adjoining property. The contour of the ground combines broad level expanses and hilly areas having north, south, east and west exposures. The soil includes clay loam, sandy loam, black bottom land, with limestone bluffs along the river. There is an unlimited supply of rock, gravel, and sand on the place. Thousands of native cedars cover the limestone hills, and the intervening ravines are filled with wild flowers. Over fifty kinds of native trees grow here, and although the list is by no means complete, over 500 different kinds of plants have been listed, some of them so rare that this is practically the only location known for them in the state. While the tract is a little further from St. Louis than was at first contemplated, the fact that the concrete road passing the place will soon be completed makes it more accessible by automobile than the original Garden was to the citizens of St. Louis at the time it was laid out by Mr. Shaw. The bus line from Union and Washington, Mo., to St. Louis, now passes the place, and

LIMESTONE CLIFFS ALONG MERAMEC RIVER, GRAY'S SUMMIT EXTENSION.

EVERGREEN NURSERY, GRAY'S SUMMIT EXTENSION.

the Missouri Pacific Railroad station is located about a mile away. The more familiar we become with this location the more ideal it seems for the various purposes for which it is to be used, and it is confidently believed that, taking everything into consideration, we have succeeded in securing an extension to the Garden which meets every present need and every future one which can possibly be foreseen. The purchase of the main portion of the tract was made last March and an additional area of about ninety acres was bought in November. No additions to this area are contemplated, since it would seem that we have quite everything necessary to take care of the future plans or developments for many years to come.

One of the pressing reasons for securing an out-of-town location was the necessity of being able to grow the Garden's magnificent collection of orchids away from the detrimental influence of a city atmosphere. Consequently one of the first things done after the purchase of the property was to contract for a range of greenhouses sufficiently large to accommodate these plants. This range, consisting of eight houses 100 feet long by 27 feet wide, an accompanying heating plant and a connecting head house, is practically completed. The benches in these houses, instead of being of the ordinary type, are constructed to hold water of a sufficient depth to grow water-lilies, thus enabling us to increase very greatly the facilities for propagating these plants. At the same time there is provided a water surface from which evaporation will assist in maintaining the moist atmosphere so desirable in the growing of orchids. An improved method of shading has been devised for these houses which it is believed will make it easier to carry the orchids through the summer. Provision has also been made for storing all the rain-water from the greenhouses in a concrete reservoir. This will have a capacity of 150,000 gallons. As a supplement to this rain-water supply a natural reservoir with a capacity of about 6,000,000 gallons has been built in the general proximity of the greenhouses. This lake has a drainage area of about eighty acres and, owing to the excessive rains during the fall, is now nearly full. When filled it will cover an area of about six acres and will afford a pleasing element in the landscaping of that part of the Garden.

A cottage for the man who will be in charge of the green-

houses is also under construction, and by early spring this part of the extension will be in operation.

Early last spring a start was made toward the development of a large nursery. Seed-beds were prepared and a quantity of seeds, chiefly from China and Austria, were planted. This fall some 3,000 evergreens in about 25 varieties were also planted out. Many of these will be of sufficient size within a year or two to be placed in a permanent position. A large collection of evergreens and deciduous plants was obtained from the Arnold Arboretum through the generosity of Professor C. S. Sargent. Included in this gift are many rare trees and shrubs not hitherto grown in this region, many of which will undoubtedly prove to be most valuable additions to the plants suitable for outside use in the vicinity of St. Louis. One of the ravines which was particularly well adapted for the growing of wild flowers has been planted with about 14,000 bulbs and roots of native plants, such as cypripediums, lilies, etc, which, while once appearing in the local flora, have long since been exterminated.

A preliminary survey of the entire tract has been made and during the coming year this will be supplemented by several special surveys, including the laying out of roads and the development of areas for a pinetum, a nut orchard, a fruit orchard, and other features designed to fit into a complete and comprehensive scheme which should be embraced in a garden of this character.

Settlement of the Two-hundred-foot Strip Matter.—At the time Henry Shaw presented Tower Grove Park to the City of St. Louis he reserved a strip 200 feet wide all around the park which was to be divided into lots, and these lots leased to those desiring to erect thereon suitable dwellings. The entire revenue derived from leasing this land was to be paid to the Board of Trustees of the Missouri Botanical Garden as one of the means of supporting this institution. With the exception of the first few years after Mr. Shaw's death, when a few hundred dollars was received from market gardeners, the Garden has never had any income from this property. It seemed to be the general consensus of opinion that the land could not be leased for the purpose indicated by Mr. Shaw, and in an effort to arrive at some solution of the problem the matter was carried through the lower

MO. BOT. GARD. BULL., VOL. 14, 1926.

VIEW TO THE EAST, GRAY'S SUMMIT EXTENSION.

BIRD'S-EYE VIEW OF NORTHERN PORTION OF GRAY'S SUMMIT EXTENSION. GREENHOUSES, ENTRENCH LEFT CORNER, FARM HOUSES, CENTER.

courts to the Supreme Court of Missouri, from which, in April, 1914, a decision was handed down. This decision held that it was the duty of the City of St. Louis to make an attempt to lease this property and to turn over to the Missouri Botanical Garden any of the rentals that might be received. In spite of this decree and numerous conferences held between representatives of the City and the Trustees of the Garden, no satisfactory solution of the various problems involved was reached until this year. It had long been recognized by the Board of Commissioners of Tower Grove Park that the erection of houses on the two-hundred-foot strip would seriously curtail the benefits of the park to the public, and all parties concerned were anxious to preserve the existing area for playgrounds and recreation purposes and yet at the same time provide for possible additional revenue for the Missouri Botanical Garden.

Mr. Shaw clearly anticipated that the income from the estate would not continue indefinitely to maintain the Garden according to the plans set forth in his will and hoped that the revenue from the two-hundred-foot strip would, in a measure at least, make up the deficit. Recognizing that any money derived from this land would be spent for the benefit of the citizens of St. Louis in augmenting the educational and recreational features of the Garden, and likewise believing that the present area of Tower Grove Park should not in any way be restricted, an ordinance authorizing the Mayor and Comptroller, on behalf of the City of St. Louis, to acquire the interest and claims of the Missouri Botanical Garden was passed and received the approval of the Mayor on April 18. This ordinance further provided that the sum of $500,000, payable $50,000 in cash and the remainder in nine equal annual payments bearing interest at 5 per cent per annum was to be appropriated for this purpose. After this ordinance became effective, pleadings were prepared and presented to the Circuit Court. These included the answer of the Attorney General, the answer of the Board of Commissioners of Tower Grove Park, the answer of the City of St. Louis, and the answer of certain ex-officio members of the Board of Trustees of the Missouri Botanical Garden. On June 24 a decree was issued by the Circuit Court authorizing the Trustees of the Garden to convey the rights and interests which they had in the two-

hundred-foot strip to the City of St. Louis for the amount and on the terms named above. Thus after a lapse of a period of nearly half a century this somewhat vexatious question has been amicably settled in probably as satisfactory a manner to all parties concerned as was possible.

The following editorial from the St. Louis Globe-Democrat so completely embodies the general attitude of the press and the public concerning the Garden and the two-hundred-foot strip that it is reproduced in full:

SQUARE DEAL FOR HENRY SHAW.

Many years ago Henry Shaw gave Tower Grove Park to the city and created Shaw's Garden for the perpetual benefit of the people of St. Louis. The one was an outright gift; the other was placed in the hands of a Board of Trustees to operate it in the public interest and to carry out the design of its founder to establish and conduct a great botanical garden which should be comparable with that world-famous garden at Kew, England, which had aroused the admiration of Mr. Shaw in his youth in that country. He wanted his city and his adopted country to have such a garden as that, and he left a large estate to provide for its maintenance.

His vision has long been realized, and his garden has contributed more to the fame of St. Louis throughout the earth than any other of the city's institutions. Indeed, there are many in foreign lands who have heard of Shaw's Garden who have never heard of St. Louis. Its celebrity is greater than the city. And for this great institution neither the city nor the people have ever paid a dollar. The park has been maintained from the public treasury, but the garden has been maintained continuously from the private resources provided for in Mr. Shaw's will. Yet its great attractions and benefits have ever been free to the people of St. Louis.

But that is not all. The garden has had to pay the city continuously for the privilege of existence. Deriving no revenue itself from the city or the people, it has had to contribute a large revenue to the public treasury. Over one-fourth of its gross income from the property of the estate, upon which it must depend for the maintenance of the garden, goes annually to the city in general taxes, and it has paid to the city, since the death of Mr. Shaw, over a million and a half dollars in special and general taxes. In addition to taxes the garden is required to pay the city for all water used, for building permits, boiler and scale inspection, licenses, and every other charge that the city levies upon private enterprises generally. Where in the world is

ORCHID RANGE OF EIGHT GREENHOUSES WITH CONNECTING HEAD HOUSE, GRAY'S SUMMIT EXTENSION.

GARDENER'S COTTAGE, NORTH HALF OF ORCHID RANGE, AND HEATING PLANT, GRAY'S SUMMIT EXTENSION.

there a public benefaction of that magnitude and character that is so penalized by the government under which it exists?

Yet the garden has never asked to be relieved of these charges, nor has it ever asked for any assistance from the city or the people. But it has been continuously growing in value, and in the variety and extent of its usefulness, while it has had to meet the increasing costs of operation that have come in recent years to all enterprises, public or private. Its present income, with these heavy charges, will not permit it to continue its high standards and provide for its necessary growth. Yet it must live within its income. It follows that additional income must be provided.

It has two sources of additional income available, one which it can draw upon on its own motion, the other dependent upon the settlement of a long-standing obligation by the city. The first is by charging admission to the garden. Mr. Shaw's will contains the provision that if sufficient funds are not available for the maintenance of the garden an entrance fee may be required of visitors. That provision has never been applied. The trustees do not want to apply it. The other source of revenue is the payment by the city of rental for the 200-foot strip around Tower Grove Park which Mr. Shaw anticipated would be leased for residence purposes and thereby add to the revenue of the garden.

That land, which does not belong to the city, has long been incorporated with the park. The city in effect has confiscated it, and has for years declined to come to any agreement for compensation for its use. Whether the city should now restore it to the garden for the uses originally intended, or whether it should pay the garden a reasonable rental for it, is not now essentially material. The point is that the city has for many years used it and continues to use it as its own, that the garden is justly entitled to a fair revenue from this land, and that the city should pay it. The failure to do so is a grave injustice and gross ingratitude to a great civic benefactor and a great civic benefaction. At the very least Henry Shaw is entitled to a square deal from the city for which he has done so much.

Construction and Repair Work.—Two important items of construction have been taken care of during the past year. One was the building of five hundred feet of concrete tunnel to house a part of the heating pipes running from the palm house to the buildings in the south end of the Garden. These pipes, although originally laid in insulated tile in the ground, had deteriorated rather rapidly, and experience of the previous winter indicated that something radical would have to be done in order to prevent a break-down in the system. The tunnel already constructed takes care of the lengths

of pipe needing immediate attention, but it is hoped that during the next year or two the remainder of the system may likewise be included in a concrete tunnel so that all the underground pipes in the Garden may be readily accessible.

The other important item attended to was the resurfacing of all the walks in the Garden. While these walks have good foundations, the surface of crushed limestone has never proved entirely satisfactory. After heavy rains or when the frost is coming out of the ground they are apt to be muddy, and on days when large crowds attended special shows the surface of the walks was so cut up that much time and labor had to be spent in repairing them. During the summer all of the walks were brought to proper grade with crushed limestone and treated with oil and tarvia, with a final surface of torpedo gravel. Experience thus far would indicate that the problem had been satisfactorily solved and that trouble from this source was now entirely eliminated.

The aquaria in the aroid house have been removed and the alcoves built up with porous rock so that they can now be used for minor displays of orchids and other attractive plants which would not normally be included in one of the regular flower shows.

The hot-water heater at the boiler house was rebuilt and various other repairs in connection with the heating plant attended to. More than the usual amount of painting and glazing was done, including the replacement of certain parts of the glass roof and sides in the palm and fern house with galvanized iron. It has been found that this does not interfere with the growing of plants and does prevent considerable breakage due to sliding snow and ice. New sectional stages were devised for use in the floral display house and many other minor matters of construction and repairs attended to.

Outdoor Planting.—The grading along Alfred and Shaw Avenues incident to the improvements in this part of the Garden has made it possible to do a considerable amount of permanent planting at the northern and western boundaries of the Garden. A large number of trees and shrubs, all from our own nursery, have been established here, and over five hundred trees were set out in other parts of the

VIEW ACROSS WOODED AREA, GRAY'S SUMMIT EXTENSION.

ARTIFICIAL LAKE, GRAY'S SUMMIT EXTENSION.

Garden. The removal of the *Magnolia grandiflora* from the grounds of Mr. Leonard Matthews, which tree was presented to the Garden by Mr. Matthews several years ago, was successfully accomplished. This is by far the largest and finest specimen of this rare tree to be found in St. Louis and it is hoped, with all the precautions taken, that it may thrive in its new location.

As a culmination of five years' experiment with various grasses it was decided that creeping bent is the type best adapted for lawns in this region. As a consequence, this grass, obtained from our own nurseries, has been used to replace the unsatisfactory growth between the main gate and the palm house and it is the intention to extend gradually the use of creeping bent in all the important lawns of the Garden. The subject was treated at length in the September, 1925, BULLETIN.

Flower Shows.—The usual floral displays have been held throughout the year. On account of the flowering of the Colombian orchids, brought to the Garden the previous year, the orchid show was the best that has ever been put on. The spring flower show of begonias, standard roses, forced iris, etc., attracted unusual attention and by some was regarded as the most beautiful show of the year. In May the Garden Club of St. Louis held its show, but the dahlia show scheduled for October was omitted because of the unfavorable weather which prevented the maturing of these flowers. The November chrysanthemum show was nearly three weeks late owing to the dark, rainy weather of the previous month, but in spite of this fact came up to the average. The show was followed by the display of red, pink, and white poinsettias which for several years have been staged at about Christmas time.

Additions to the collections of blooming plants include 160 named varieties of iris from the New York Botanical Garden, as well as forty new varieties of Japanese iris purchased, and forty-five varieties of rare camellias, the pick of the European markets, deposited at the Garden by the D. Hill Nursery Co. From Europe, besides valuable donations from Kew and Glasnevin, a considerable number of hybrid orchids were purchased by Mr. Pring on his trip abroad last summer.

Because of the great publicity which the Garden has received during recent years through its orchid collection, a special request was received from the management of the National Flower Show held in Kansas City in March that we exhibit orchids on this occasion. Special crates were designed and built at the Garden in which some 300 orchids in full bloom were shipped to Kansas City and return without damage. The exhibition, though small, attracted a great deal of attention and received the gold medal awarded by the Society of American Florists and Ornamental Horticulturists, as well as the gold medal of the American Orchid Society. This Society also awarded the Garden a silver medal for the collection of cypripediums shown.

School for Gardening.—Miss Edith Mason and Miss Katherine Perkins completed the regular three-year course and were awarded certificates in June, 1925. Mr. H. E. White, having decided to specialize in purely horticultural lines, transferred his credits to Purdue University. An account of his researches on poinsettias appeared recently in the BULLETIN. Three new students registered this fall, but as in the past few years, the main energies of the school have been devoted to the training of disabled soldiers under the auspices of the U. S. Veterans' Bureau. Four of these men completed their work during the year and all have been placed in positions. Five vocational students are still registered in the school and will finish their training, so far as the Garden is concerned, in June, 1926, when the assistance rendered by the Veterans' Bureau will terminate. The discontinuance of this vocational work by the Veterans' Bureau will enable us to bring about the long-contemplated reorganization of the school next fall.

Annual Bequests.—The unique bequests of Mr. Shaw setting aside funds for the entertainment of distinguished visitors, as well as for the Trustees and members of the Garden force, have made it possible for the Garden to extend its hospitality to two national organizations. In May the members of the American Museums Association, which included the directors of natural history, art, and educational museums throughout this country, were entertained at luncheon and conducted through the Garden. On December 27 delegates on their way to the meeting of the American Association for

the Advancement of Science, in Kansas City, spent the day at the Garden. The library, herbarium, and laboratories were open to inspection, and many of the visitors availed themselves of the opportunity to consult these important research facilities of the Garden. Demonstrations of some of the scientific work in progress were made. Luncheon was served at the Garden, and after a dinner in the evening the delegates were transported to the station and took train for Kansas City.

The annual flower sermon, provided for in the will of Mr. Shaw, was preached at Christ Church Cathedral by the Rev. Harry P. Nichols, D. D., of New York City. The bequest provided by Mr. Shaw for "premiums or prizes at a flower show or exhibition" was participated in by the Garden Club of St. Louis, being used for prizes awarded at the show in May.

RESEARCH AND INSTRUCTION

During 1925 the experimental projects under investigation have been greatly diversified. Studies on variegation and mosaic diseases have continued, and there is being attempted the establishment of a collection of living material representing such an assortment of "decorative" variegations as will serve for consecutive investigation of the nature and relations of these variations. Numerous fundamental and practical problems in the direction of the physiology, cytology, pathology, and genetics of such material await attention. The general significance of "virus diseases" of plants is still unsettled, and the best approach to a general understanding of this class of infectious agencies is thought to be through such readily transferable and typically active diseases as the mosaic disease of tobacco and tomato.

Other projects include special phases of physiological pathology, methods of nitrogen analyses, the effects of conditions on the absorption and exosmosis of ions by roots, certain relations of the bacteria, investigation of the subterranean algal flora, statistical study of the smoke content of the St. Louis air, and development of the method of growing orchid seedlings. For the first semester there are being offered the usual research courses in physiology, morphology, and tax-

onomy, with broader relations, especially in pathology, bacteriology, and horticulture.

The equipment for research is constantly being added to, especially in the direction of physical-chemical apparatus; and with the natural development of the demand for opportunities to undertake fundamental experimental study, on the part of young investigators, the need of a building adapted primarily for research purposes is becoming increasingly urgent.

Published Articles.—During the past year five numbers of the Annals, a quarterly journal of scientific researeh, have appeared or are in press, including No. 4 of Volume XI, and Nos. 1, 2, 3 and 4 of Volume XII. The articles appearing in these issues are as follows:

Zeller, S. M., and C. W. Dodge, "Leucogaster and Leucophlebs in North America." Vol. XI, pp. 389-410. 1924.

Harris, J. Arthur, "Variation and Correlation in the Inflorescence of Manfreda virginica." Vol. XI, pp. 411-459. 1924.

Epling, Carl C., "Monograph of the Genus Monardella." Vol. XII, pp. 1-106. 1925.

Epling, Carl C., "Studies on South American Labiatae." Vol. XII, pp. 107-132. 1925.

Young, H. C., "Colloidal Sulphur as a Spray Material." Vol. XII, pp. 133-143. 1925.

Howard, Grace E., "Pigment Studies With Special Reference to Carotinoids in Fruits." Vol. XII, pp. 145-212. 1925.

Burt, E. A., "The Thelephoraceae of North America. XIV." Vol. XII, pp. 213-357. 1925.

Tisdale, L. E., "Colloidal Sulphur: Preparation and Toxicity." Vol. XII, in press.

Duggar, B. M., and Joanne Karrer Armstrong, "The Effect of Treating the Virus of Tobacco Mosaic With the Juices of Various Plants." Vol. XII, in press.

Ranker, E. R., "Determination of Total Nitrogen in Plants and Plant Solutions." Vol. XII, in press.

Scientific and Popular Lectures and Papers.—During the year a number of lectures have been delivered or papers read on scientific and popular topics by members of the scientific

and Garden staffs to special audiences as follows:

B. M. Duggar, January 1, before the Botanical Society of America, presidential address, "Physiology in the Service of Pathology."

Hermann von Schrenk, January 13, before the New England Railroad Club, at the Copley-Plaza Hotel, Boston, "Preservation of Forest Products."

Hermann von Schrenk, January 19, before the Southern Conservation Congress, Little Rock, Ark., "Forest Conservation from the Standpoint of the Consumer."

Hermann von Schrenk, January 30, Jane Aldred Lecture at the Massachusetts Institute of Technology, Cambridge, Mass., "Forestry, Pathology, and Engineering."

B. M. Duggar, February 16, before the Washington University chapter of Sigma Xi, on "The Behaviour of the Causal Agency in Certain Plant Virus Diseases."

Edgar Anderson, March 10, before the Izaak Walton League of Webster Groves, "Metropolitan Parks."

George T. Moore, March 13, before the St. Louis Business and Professional Women's Club, at Second Presbyterian Church, "Cultivating a Garden."

Edgar Anderson, March 15, before St. Andrews Brotherhood, "The Life of the Bumblebee."

George T. Moore, March 26, before the St. Louis Woman's Club, "What Goes On in the Soil."

G. H. Pring, March 28, at Cleveland Flower Show, "Cultivating and Collecting Orchids."

J. M. Greenman, April 1, before the Phi Sigma of Washington University, "Botanical Observations in Central America."

Edgar Anderson, April 14, before the Parent-Teachers' Association of the Locust Grove School, "Forestry."

George T. Moore, April 16, before the members of the Women's Chamber of Commerce, as part of the City Beautiful program, "Lawns and Flowers."

George T. Moore, April 21, before the Cincinnati Chamber of Commerce, "What Good Is a Botanical Garden?"

George T. Moore, April 24, before the American Philosophical Society, Philadelphia, "The Subterranean Algal Flora," and "Analysis of the Smoke Pollution of the Air of a Large City by Means of the Owen Automatic Filter."

Hermann von Schrenk, April 30, before the Canadian In-

stitute of Engineers, at Montreal, "Timber Preservation."

B. M. Duggar, April 30, before the scientific staff of the Ohio Agricultural Experiment Station, "Some Principles in Research."

George T. Moore, May 1, before the Sales Managers' Bureau of the Chamber of Commerce, "Conservation of Forests and Natural Resources."

George T. Moore, July 6-10, delivered a series of lectures on botanical subjects at the Rocky Mountain Laboratory of the Western State College of Colorado, at Gunnison, Colorado.

B. M. Duggar, August 25, before Rotary Club of West Chester, Pennsylvania, "Promotion of Research in Agriculture by the National Research Council."

G. H. Pring, September 18, before the St. Louis Greens Committee at the Algonquin Club, "Grasses for St. Louis."

George T. Moore, September 22, before the Northern Nut Growers' Association convention at St. Louis, "Environmental Requirements of Nut Trees."

G. H. Pring, November 3, before the Men's Club of the Clifton Heights Presbyterian Church, "The Royal Botanic Gardens, Kew, London, England."

G. H. Pring, November 16, before the Florists' Club, "Iowa State Flower Show."

George T. Moore, December 10, before the St. Louis Florists' Club, "Relations Between the Garden and the Florists."

B. M. Duggar, December 29, before the Botanical Society of America, "The International Congress of Plant Sciences."

G. H. Pring has given his lecture, "Collecting Orchids in South America," before the following audiences: Electrical Board of Trade, January 20; the Brotherhood of St. Paul Evangelical Church, February 11; Springfield Garden Club, Springfield, Illinois, February 24; Men's Club of the Clifton Heights Presbyterian Church, March 3; Peabody School Patrons' Association, March 11; the pupils of the Harris Teachers' College, March 11; Iowa State College, Ames, Iowa, November 5; the Kirkwood Garden Club, Kirkwood, Missouri, November 13; the Traffic Club, November 16; the Parent-Teachers' Association of the Clinton School, December 3.

Other Outside Scientific Activities.—Since the present is rather conspicuously a period of cooperation and reorganization in research and research agencies the members of the

scientific staff have contributed time and effort, as far as seemed desirable and practicable, to the general developments in botanical science. Accordingly, various scientific meetings have been attended—often with the presentation of papers or reports—and offices of responsibility have been held in representative societies or associations.

Some of these activities may be listed as follows:

George T. Moore and B. M. Duggar attended the meeting of the American Philosophical Society, Philadelphia, April 24-25, 1925, the former presenting two papers.

George T. Moore, B. M. Duggar, Edgar Anderson, Everett F. Davis, Elva Pumphrey (Mrs. H. M.) Miller, E. R. Ranker, and Fannie Fern Smith attended the meeting of the American Association for the Advancement of Science and affiliated societies, at Kansas City, December 28-31.

Participation in the work of organization of the International Congress of Plant Sciences, to be held at Ithaca, New York, August, 1926, has been effected through the activities of B. M. Duggar as chairman of this committee and of George T. Moore as treasurer of the Congress. The former also attended a meeting of the committee at Ithaca, New York, September 17.

Hermann von Schrenk has continued to serve as president of the Missouri Forestry Association.

B. M. Duggar and J. M. Greenman have edited respectively the sections "Physiology" and "Taxonomy of Vascular Plants" in "Botanical Abstracts."

As Chairman of the Division of Biology and Agriculture of the National Research Council, B. M. Duggar spent the major part of the summer—July–September—at Woods Hole, Massachusetts, where the summer office of the Division is maintained.

B. M. Duggar has continued to serve as secretary of the Union of American Biological Societies.

George T. Moore was re-elected a member of the Committee of One Hundred on Scientific Research, and has continued to act as Vice-President of the American Orchid Society.

Graduates, Fellows, and Investigators.—The experimental research, as heretofore, has been conducted by members of the scientific staff of the Garden, graduate students registered as candidates for degrees in the Henry Shaw School

of Botany of Washington University, and special research assistants or investigators engaged upon co-operative or independent investigations.

Graduate Students.—During the calendar year the following graduate students have been in residence: Dorothy M. Anderson (Mrs. Edgar), formerly teaching fellow; Walter J. Bach, formerly Lackland Research Fellow; Everett Fogg Davis, instructor in Washington University; Myrtle E. Grenzebach, formerly teaching fellow, Washington University; Meta Gummersheimer; C. E. Kobuski; Elva Pumphrey Miller (Mrs. Harry M.), formerly teaching fellow; Emery R. Ranker; Fannie Fern Smith; L. E. Tisdale, formerly Crop Protection Institute Fellow; Esther L. Larsen; J. Paul Reeves; D. C. Neal; T. Fukushi, professor of botany at the Agricultural College, Tottori, Japan.

Rufus J. Lackland Fellows.—Holders of these fellowships for the academic year, 1925-1926, are as follows: Clarence Emmeren Kobuski, B. S. Cornell University, M. S. Washington University, 1925, reappointed second year; Emery R. Ranker, B. S. and M. S. Utah Agricultural College, Assistant, Department of Horticulture, Utah Agricultural College, reappointed second year; David Carleton Neal, B. S. Mississippi A. & M. College, M. S. Washington University, who held a Lackland Fellowship in 1916-17, and now holds the position of professor of plant pathology and pathologist to the Mississippi State Plant Board and Agricultural Experiment Station, A. & M. College, Mississippi, has been reappointed to a Lackland Fellowship and also holds a special fellowship from the American Fertilizer Association; Fanny Fern Smith, B. S. and M. S. Washington University, reappointed third year.

Teaching Fellows.—During 1924-25, Myrle E. Grenzebach, A. B. Oberlin College; Elva Pumphrey Miller (Mrs. Harry M.), A. B. and M. S. Ohio Wesleyan University, Graduate Assistant, University of Illinois, Research Assistant 1925-1926. During 1925-1926, Esther L. Larsen, A. B. University of Montana; and J. Paul Reeves, A. B. State Teachers' College, Peru, Nebraska.

Degrees and Assignments.—At the commencement of Washington University, June 12, 1925, degrees were conferred

upon students in the graduate laboratory of the Garden as follows: Master of Science, Myrle E. Grenzebach, Teaching Fellow (thesis topic "A Revision of the Genus Bouchea [Exclusive of Chascanum]"); Meta Gummersheimer (thesis topic "Cell Proliferation and Growth Stimulation in Certain Tissues of Plants"); Clarence E. Kobuski, Lackland Research Fellow (thesis topic, "Revision of the Genus Priva").

HERBARIUM

The herbarium has maintained an average growth during the past year, although the total number of specimens acquired is somewhat smaller than it was in 1924. This is due to the fact that no single large collection or private herbarium was obtained during the year. The new material acquired represents a wide geographical range, and substantially augments the general herbarium, not only in North American plants, but in a comparatively large number of exotics, thus greatly increasing the value of the herbarium for comparative studies.

Several units of steel cases were installed during the year. These cases conform to the type of herbarium cases previously installed, but are specially designed with adjustable shelves to accommodate the pine-cone collection of the Engelmann Herbarium and the rapidly growing fruit and wood collections which are too bulky to mount on standard herbarium sheets.

New Accessions.—The more noteworthy individual collections which have been added during the year are the following: Cyril Allen, 160 plants of Colombia; Arnold Arboretum, 1026 plants of North America, collected by E. J. Palmer; E. Bartholomew, 200 North American fungi; Botanic Garden, University of Cluj, by Dr. Al. Borza, 200 plants of Roumania; Botanical Garden, Leningrad, Russia, by Professor Boris Fedtschenko, 336 plants of central Asia, Turkestan, Transcaspian region, and Brazil; W. E. Broadway, 400 plants of Trinidad & Tobago; B. F. Bush, 191 plants of Missouri; Canton Christian College, 176 plants of Hainan, China, collected by F. A. McClure; Mrs. Agnes Chase, 268 plants of Brazil; Hon. Joseph R. Churchill, 31 plants of Virginia; Professor J. A. Drushel, 70 plants of

the United States; D. Lewis Dutton, 405 plants of Vermont; Dr. Carl C. Epling, 90 plants of California and Idaho; George L. Fisher, 207 plants of Mexico; Herbert C. Hanson, 390 plants of Arizona; Professor L. F. Henderson, 669 plants of Oregon; John M. Holzinger, 25 mosses of North America; C. E. Kobuski, 84 plants of New York; G. K. Merrill, 50 lichens of the United States; Dr. E. B. Payson, 22 plants of Colorado and Utah; Dr. Morten P. Porsild, 104 plants of Greenland; Miss Christine Fredrika Posse, 51 plants of New Mexico; George H. Pring, 236 plants of England; Robert Ridgway, 156 plants of Illinois; Dr. Hermann von Schrenk, 191 plants mainly from Switzerland; Dr. F. L. Stevens, 156 fungi from Central America and British Guiana; United States National Museum, 493 plants chiefly from North America, Mexico, and Central America; Dr. I. Urban, 47 plants from West Indies; Th. Oswald Weigel, 300 plants of Argentina collected by W. Lossen; Dr. E. Werdermann, 376 plants of Chile; Kirk Whited, 196 plants of Alaska. Numerous smaller collections have been received from correspondents and friends of the Garden, which have been recorded in current numbers of the BULLETIN.

Mounting and Distribution.—Nearly 10,000 specimens have been mounted and distributed in the herbarium during the fiscal year.

Field Work.—Field work has been continued in the vicinity of St. Louis during the year as time permitted. Local botanists and friends of the Garden have contributed numerous native plants of special interest. The effective field work carried on in Colombia, South America, in 1924, by Mr. Cyril Allen was continued in 1925, and a substantial collection of vascular plants was obtained by him in the Magdalena River Valley of Colombia. Owing to unusually heavy rains and a prolonged wet season, travel in Colombia during the past season was rendered exceedingly difficult and progress to the higher altitudes was seriously delayed. The enforced delay in the low country brought on acute malaria, resulting in Mr. Allen's untimely death in the spring of 1925. Special arrangements were made whereby Mrs. Agnes Chase of the United States Department of Agriculture was commissioned to collect certain groups of plants for the Missouri Botanical Garden during her recent botanical expedition to Brazil. As

a result the Garden has secured an interesting and valuable series of Compositae from southeastern Brazil.

Exchanges.—Several important series of herbarium specimens have been received from institutions with which the Garden maintains exchange relations, and from individual correspondents. A comparatively small number of duplicate herbarium specimens has been distributed during the year.

Use of the Herbarium by Outside Botanists.—The past year has brought an increased number of visiting botanists to consult the herbarium. Several loans of specimens have been made to institutions in different parts of the country for comparison and study by specialists; loans have also been made to the Garden for the benefit of those pursuing a detailed study of special groups of plants. In all cases, this interchange of material has been mutually advantageous and has furthered the opportunity for critical study and monographic research. The recent publication in the ANNALS OF THE MISSOURI BOTANICAL GARDEN of a "Monograph of the Genus Monardella" by Dr. Carl Clawson Epling, and "Studies on South American Labiatae. I" by the same author, being the results of work carried on primarily at the Garden, has resulted in augmenting substantially the herbarium representation of the genera concerned as well as a more thorough organization of the material of the entire family of Labiatae.

Statistical Summary (For the year ending December 31, 1925).

Number of specimens received on new accessions:			
By purchase	4,715		
By gift	1,108		
By exchange	1,216		
By field work.....	443		
Total	7,482	valued at	$748.20
Number of specimens mounted and incorporated.....	9,101	valued at	1,820.20
Number of specimens discarded from the herbarium.....	39	without value	

Number of specimens in organized herbarium	921,387	valued at	$146,172.50
Number of specimens in unorganized herbarium	86,019	valued at	7,258.56
Wood specimens, etc., supplementing the herbarium		valued at	280.00
Microscopic slides, etc.		valued at	410.10
Total valuation			$154,121.16

LIBRARY

The library staff has been occupied throughout the year in caring for the present contents of the library in space which has become inadequate through its growth. Besides incorporating the numerous additions of the year, in the way of authors' separates, books, and serial publications, the library staff has the task of editing the two publications of the Garden. A good deal of time has been required during the year for preparing the list of periodicals in the Garden library for the "Union List of Serials in the Libraries of the United States and Canada." The last issue of this work included G–I.

The library is used, not only by investigators in residence and by visitors who come to consult the literature in their various fields of research, but also by other educational institutions. During 1925, 19 such institutions borrowed from us 110 books on the interlibrary plan.

Part 4 of Vol. XI, and parts 1 and 2 of Vol. XII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN have been published during the year and parts 3 and 4 are now in press. The three parts issued contain 299 pages of text, 13 text-figures and 20 plates. The ANNALS is our principal medium of exchange for publications of other scientific societies and institutions.

The thirteenth volume of the monthly Garden BULLETIN was published during the year. While the BULLETIN was originally intended to serve primarily as a means of informing the public as to what is of particular interest at the Garden, this field has been considerably extended in recent years until its contents now cover a great variety of horticultural and floricultural subjects. It now fills a distinct need among those amateurs interested in the establishment of gardens in this region. From practically every issue ar-

ticles are reprinted in various publications throughout the country, and it is in increasing demand all over the United States. Visitors frequently ask to see some special plant or collection about which they have read in the BULLETIN, or in some publication copying its articles.

Both the ANNALS and the BULLETIN are supplied to regular subscribers. Separates of the various articles in the ANNALS are also for sale by the library. The cash receipts from such sales for the year, and for views of the Garden, were $1699.32.

Statistical.—There have been donated to the library or received from our correspondents during the past year 466 volumes, valued at $1059.27, and 2323 pamphlets, valued at $213.96, and 5 maps. Three hundred and thirty volumes were bought at a cost of $1747.33, and 273 pamphlets costing $396.08, and 10 maps costing $1.00. The library now contains 41,445 books and 57,712 pamphlets, a total of 99,157, valued at $142,261.21. There are also 330 manuscripts, valued at $1609.80, and 925,278 index cards, valued at $10,446.50. A total of 6,235 index cards have been added during the year, of which 686 were written by library employes; 5,549 were bought at a cost of $138.95. Two hundred and twenty-two books were bound.

Dr. Burt, after twelve years of service as librarian, is retiring at the end of the year. It is with regret that the Garden is forced to dispense with his services, since he has been most faithful in his direction of the library work, and his contributions to science as Mycologist to the Garden have added greatly to its prestige.

ATTENDANCE FOR THE YEAR 1925.

	Week-days	Sundays
January	3,945	3,427
February	3,212	3,247
March	6,109	7,163
April	6,725	10,693
May	12,476	13,776
June	8,031	9,686
July	10,688	8,755
August	20,210	21,381
September	8,050	7,914
October	8,046	7,669
November	33,304	20,160
December	3,792	1,957
	124,588	115,828
		124,588
Total		240,416

Respectfully submitted,

GEORGE T. MOORE, Director.

STATISTICAL INFORMATION FOR DECEMBER, 1925

GARDEN ATTENDANCE:
Total number of visitors..... 5,749

PLANT ACCESSIONS:
Total number of plants received as gifts..... 51
Total number of seed packets received as gifts..... 2

LIBRARY ACCESSIONS:
Total number of books bought..... 19
Total number of books and pamphlets donated..... 43

HERBARIUM ACCESSIONS:

OCTOBER

By Gift—
Aiken, W. H.—*Chamaebatia foliosa* Benth., from California 1
Bettis, Mrs. James R.—*Polygonum dumetorum* L., from Horticulture 1
Kellogg, John H.—Mosses of Franklin County, Missouri 2
Newson, A. W.—Plants of Alabama..... 4
Pessin, Prof. L. J.—*Eupatorium incarnatum* Walt., from Texas 1
Prunty, Charles E.—*Aristida purpurascens* Poir., from Virginia 1
Rusby, Dr. H. H.—*Senecio sinapoides* Rusby from Bolivia 1

By Exchange—
United States National Museum, by Dr. J. N. Rose—
Plants of Mexico and Cuba..... 7

By Purchase—
Whited, Kirk—Plants of Alaska..... 196

By Field Work—
Chase, Mrs. Agnes—Plants of Brazil..... 268

Total 482

NOVEMBER

By Gift—
Coulter, Professor J. M.—Plants of Texas..... 2
Fuller, Dr. George D.—Plants of Alabama..... 1
Jones, J. S.—*Petiveria alliacea* L., from Florida..... 1
Newson, A. W.—Plants of Alabama..... 5
Ridgway, Robert—Plants of Illinois..... 24

By Purchase—
Broadway, W. E.—Plants of Trinidad and Tobago, British West Indies 400

Total 433

DECEMBER

By Gift—

Chase, Mrs. Agnes—Photograph of a Brazilian Composite	1
Cody, W. E.—Plants of Florida	2
Posse, Miss Christine Fredrika—*Arctostaphylos Uva-ursi* Spreng., from New Mexico	1

By Exchange—

Epling, Dr. Carl C.—Bark specimens of plants of Idaho	61
Epling, Dr. Carl C.—Fertile cone of *Araucaria Bidwellii* Hook., from Horticulture	1
Rose, Dr. J. N.—Cultivated specimen of *Dioon* sp.	1
University of Minnesota, by Prof. V. O. Rosendahl—*Sullivantia* sp. from Minnesota	1
United States National Museum, by Dr. J. N. Rose—Plants of Mexico	9
Total	77

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Aquatics

G. NINTEMAN,
Construction

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Herbaceous and Nursery

J. ULRICH,
Inside Floral Display

H. VALLENTINE,
Carpenter

Missouri Botanical Garden Bulletin

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NORMAL POSITION OF SAPUCAIA FRUIT WHEN SUSPENDED FROM THE TREE.

SHOWING INTERIOR AND LID, WITH PORTION OF THE COLUMN.

Missouri Botanical Garden Bulletin

Vol. XIV FEBRUARY, 1926 No. 2

THE SAPUCAIA NUT

The genus Lecythis includes some of the most ornamental trees of the forests of South America. The fruit is extremely interesting, in most species being very large, thick, and variable in shape, and, owing to its weight, hanging in an inverted position. When ripe a swelling is at first noticed around the opercular zone, and afterwards, by rupture of the central column, the operculum, or lid, falls off with a portion of the attached column (pl. 10). The seeds, which are not unlike the Brazil nut, hang down in bunches which soon become loosened from the hard shell, dropping to the ground below. The main body or shell remains suspended from the tree for a long time.

The writer observed sapucaia trees about 100 feet in height, growing along the Magdalena River, in Colombia. Later he saw cultivated specimens at the Hope Gardens at Kingston, Jamaica, where as many as one hundred fruits were suspended from a single tree. It behooves visitors to stand clear of the branches, as the falling shells which weigh as much as two pounds, may cause injury. Under the name monkey pots the seeds of several species of Lecythis are exported to Europe, where they are regarded as greatly superior in delicacy and flavor to the closely allied Brazil nut.

THE CONIFERS OF MISSOURI

Conifers are what their name literally implies, cone-bearing trees and shrubs. Their outstanding characteristics are stiff, dark, and usually evergreen leaves, even-grained wood,

and a resinous sap. They are a very ancient group, geologically speaking, some of them, very much like present-day forms, having been found in rocks of the Mesozoic Age. There are in the world, mostly in the South Temperate and North Temperate zones, somewhere in the neighborhood of 350 species, belonging to about forty different genera. Of these genera, three are native to Missouri, Pinus (the pine), Juniperus (the juniper), and Taxodium (the bald cypress). Each is represented in our state by a single species.

THE SHORT-LEAVED PINE

(*Pinus echinata* Mill.)

"What the apple is among the fruits, what the oak is among the broad-leaved trees of the temperate zone, the pines are among the conifers, excelling all other genera in this most important family in number of species, in fields of distribution, in extent of area occupied, in usefulness and importance to the human race." There are in the neighborhood of eighty distinct species of Pinus, over half of which are native to North America. They are characterized by their long needle-like leaves borne in bundles, with a tiny sheath at the base. Their cones are woody and require two or three years to mature. Missouri's representative is *Pinus echinata*, the short-leaved pine—so called to distinguish it from the long-leaved pine of the South, *Pinus palustris* Mill. As a matter of fact, the short-leaved pine has needles of a very respectable length when compared with pines growing farther north.

Although the short-leaved pine is native to southern Missouri and occasional specimens are found within twenty-five miles of Saint Louis, it is almost unknown to the general public. Yet it is one of the most important timber trees of America and grows over a wider area than any other American pine. It originally occurred scatteringly from the Hudson Valley, southward to the Gulf States and westward through the Ohio Valley to Missouri, Arkansas, and eastern Oklahoma. In all it has been found in twenty-four states. At the present time, however, it does not occur in commercial

SECOND GROWTH OF SHORT LEAF PINE, NEAR NEW OFFENBURG, MO

SHORT-LEAF PINE STARTING UP IN A PASTURE, NEAR NEW OFFENBURG, MO.

quantities north of Virginia or in the Ohio Valley. In Missouri it is native to the Ozark region, occasionally forming pure stands but usually mixed with oak and hickory. It has been excessively lumbered, and most Missouri pine is second or third growth. One of the largest tracts of virgin timber yet remaining, covering an area of over one thousand acres in southern Dent County, is being lumbered at the present time. The only other large tract of virgin short-leaved pine in Missouri known to the writer is a stand of over five hundred acres near the forks of the Black River in Reynolds County. Most authorities describe the tree as occurring only in the extreme southern part of the state, but as a matter of fact, scattered colonies are found as far north as Jefferson County. The nearest colony to Saint Louis is at Cedar Hill on the Gravois Road. There are a few scattered trees a few miles nearer to the city, just east of the town of High Ridge. These trees, however, are in old family graveyards and were probably not native to the immediate neighborhood.

As might be expected of so widely distributed a tree, the short-leaved pine has a number of popular names. In Missouri it is commonly called yellow pine, but the Forest Service discourages the use of this name because of confusion with the western yellow pine, a totally different species. Rosemary pine and two-leaf pine are common names in the South. In some districts it is called spruce pine, perhaps because of its symmetrical shape.

Its technical botanical description is as follows:

> Buds blunt, scaly; leaves 3 to 5 inches long, in bundles of two or three, dark, slender, flexible, acute-pointed; cones abundant, maturing in two years, 1½ to 2½ inches long, ovate; scales 4-angled at tip, usually bearing a short, recurved prickle; seeds winged.

The form of the tree is very distinctive. The trunk, straight and unbranched, rises to a height of over a hundred feet in mature specimens. This habit and the comparatively small top make it an economical tree to lumber.

As a timber tree its value has been appreciated for over two hundred years. It was originally common on the upper reaches of the Potomac, where it was lumbered in Colonial

times. Its earliest use was for boat building and it is interesting to note that it is still in large demand for this purpose, being used for nearly every part of the boat which is made of wood. Its handsome grain and good wearing qualities have recommended it for interior finishing where it has been very largely used for window and door-frames, base-boards, and the like. It is not as strong as long-leaved pine and the latter has been preferred for structural timbers except in certain cases where the short-leaved species has been more desirable because of its lighter weight.

Several characters make the tree particularly useful in reforestation projects. Most important from an economic standpoint is the ability of the young trees to sprout up from the root after the top has been killed by fire. The species reproduces itself unusually well. The seeds are light and are borne in abundance, even by young trees. They are furthermore less particular about germinating conditions than are the seeds of most pines, and will even germinate well in the grass or among leaf litter. Thanks to these characteristics it is able to wage a winning fight against civilization. It invades abandoned fields and cut-over lands in much the same fashion as does the white pine (*Pinus Strobus* L.) in New England and New York. These second-growth stands of *Pinus echinata* are yearly becoming a more common sight in the South and much of the Missouri pine forest is of that character.

THE BALD CYPRESS

(*Taxodium distichum* Rich.)

The bald cypresses are the dwindling survivors of an ancient group of trees. In the early Tertiary period when great dinosaurs roamed through lush forests, the bald cypresses flourished over the entire northern hemisphere. To-day only two species are left. To one of these, the Mexican cypress, belongs the oldest living tree in the world, described in the December, 1916, number of the BULLETIN. The other species, *Taxodium distichum*, occurs scatteringly in swamps along the Atlantic coastal plain, the Gulf coast, and

* T. mexicanum Rich.

BRANCH OF SHORT LEAF PINE, SHOWING CONES AND LEAVES.

BALD CYPRESS AT THE GARDEN.

the southern Mississippi basin. In Missouri it is native only to the swamp lands in the southeastern corner of the state.

In Saint Louis the finest specimens are in Tower Grove Park and the Garden where they were planted thirty-five to forty years ago by the late James Gurney. There is a particularly fine double row of them along the drive in the eastern end of the Park that gives much the same effect as Italian cypresses.

The technical botanical description is as follows:

> **Tall tree, narrowly cone-shaped, up to 150 feet high, becoming round-headed in age; bark light reddish-brown, narrowly furrowed; wood soft, easily worked, durable; leaves deciduous together with the lateral branchlets, linear, ½ to ¾ inch long, two-ranked, acute-pointed, light green; fruit, globose woody cones 1 inch in diameter; seeds winged, 2 under each scale.**

The outstanding characteristics of the tree are its pyramidal shape, its feathery, light green foliage, and its slow growth. The fact that it takes over a century to produce a mature specimen perhaps accounts for its not having been more commonly planted. Although it takes kindly to cultivation, is even resistant to smoke, and a number of nurseries carry the cypress in stock, it has been very little used in landscape work. Yet it is hardy as far north as central Michigan and on account of its graceful foliage is beautiful even when small. It is particularly handsome in the fall when the leaves turn various shades from golden brown to light yellow.

Though the tree has been slow in winning recognition for its beauty, its utilitarian qualities have long been recognized. Because of its durability it has been very much used in the South. In New Orleans the city fathers even made water mains from cypress which gave good service for nearly a century. Coffins, and in at least one case, tombstones, have been made from the wood. Since the letters on the latter were still legible after a century and a half, it was at least as durable as many of the stones used for that purpose. At the present time most of the cypress lumber is being used in two ways, interior finishing and greenhouse construction. For the latter, on account of its durability under exacting condi-

tions, it stands in a class by itself. The new greenhouses which are being built for the Garden at Gray's Summit have cypress doors and woodwork.

THE RED CEDAR

(*Juniperus virginiana* L.)

The genus Cedrus, the true cedar, to which belong the famous Cedars of Lebanon, has no representative in North America. Yet the name is in our blood and we have given it popularly to a number of conifers belonging to quite different genera. Some of the most common examples are the "northern white cedar," a member of the genus Thuja, the "coast white cedar," a member of the genus Chaemaecyparis, and the "California incense cedar," a Libocedrus. The commonest of these "cedars" and the only one native to Missouri is the "red cedar," *Juniperus virginiana*. As one might suspect from the scientific name, it is really a juniper. If we were to split hairs we should speak of "juniper fence posts," "juniper pencils," and even "juniper hope chests." Redwood, however, has in recent years been very largely substituted for cedar in the manufacture of chests so that one name is perhaps as good as another.

The junipers as a group are most easily distinguished by their fruit. Though it is actually a cone, the separate scales are so swollen and grown together that it looks more like a berry. The fruits of one of our Eastern species have of late years been a very familiar sight in drug store windows, as it is they which give gin its distinctive resinous tang.

Juniperus virginiana is the one conifer native to our immediate neighborhood and should be familiar to every resident of Saint Louis. Formerly native within the city limits and very largely planted about dooryards, it has been driven out like the other conifers and there are no healthy specimens within the smoke zone. One of the glories of the Garden's new reservation at Gray's Summit is what is probably the finest natural grove of red cedars in this section of the country. It covers an irregular area of over one hundred acres in

RED CEDAR AT GRAY'S SUMMIT EXTENSION.

the southwest portion of the reservation. Like many cedar groves in Missouri, it occupies a dry southern slope with thin soil and frequent outcrops of limestone rock.

The red cedar has a very wide range. Its natural habitat is from Maine to the Gulf coast and westward to the Rockies. It is everywhere variable in color and shape. Many of the unusual forms have been vegetatively propagated and are for sale by nurserymen. The normal color of the leaves is a dark green, almost bronze on the most exposed portions, but there are light green and yellow-tipped varieties. The wild type and the several varieties have been extensively planted, particularly in this part of the country. Unfortunately they do not transplant at all well, a conservative estimate of the percentage of failures being close to fifty per cent. The thickly clothed branches make the tree a good windbreak and it has been much planted for this purpose. It is a particularly good tree for bird sanctuaries since it supplies food as well as shelter. Birds are very fond of the berry-like cones and have been an important agent in distributing the tree. Red cedars will very commonly be observed to spring up near fence posts and other places where birds have roosted.

The tree has one bad habit which prohibits its unqualified recommendation for general planting. It is the alternate host of the fungus which causes apple rust. The so-called "cedar apples," plump, gelatinous balls with orange spurs, are in reality one stage of the apple rust. Just as the wheat rust spreads from the wheat to the barberry and back to the wheat again, so the apple rust jumps back and forth between the cedars and apples. For this reason red cedars should not be planted in the vicinity of apple orchards.

The technical botanical description is as follows:

> Shrub or small tree to 100 feet high, usually much smaller; bark reddish, fibrous, shredded; wood soft, sapwood white, heartwood purplish-red, fragrant; leaves of two kinds, opposite, persisting several years; fruit a berry-like cone, dark glaucous blue, resinous, inclosing one or two angular grooved seeds.

The purplish-red heart-wood from which the tree takes its popular name has a pleasant resinous odor. When free from knots it has a fine, straight grain. It is soft and easily

worked yet very durable. It was one of the first woods to take the notice of the early American explorers and by the middle of the seventeenth century the tree was already well established in European gardens. Its durability and ease of working recommended it for a variety of uses and as early as 1740 Benjamin Franklin sounded the first warning note, a note which for nearly two centuries has remained practically unheeded. We find him writing as follows in "Poor Richard's Almanack" for 1749:

"By a diligent observation in our provinces and several adjacent, I apprehend that timber will soon be very much destroyed, occasioned in part by the necessity that our farmers have to clear the greatest part of their land for tillage and pasture, and partly for fuel and fencing. The greatest quantity of our timber for fencing is oak, which is long in growing to maturity, and at best is of short duration; therefore, I believe it would be to our advantage to endeavor to raise some other kind of timber that will grow faster or come sooner to maturity and continue longer before it decays.

"The red cedar (a species of juniper) I take to be the most profitable tree for fencing and several other uses that we can raise in our country, considering how easily it may be raised from seed, its readiness to grow on most kinds of soil, its quick growth, the profits it will afford while it is arriving at maturity, and the long duration of the wood when grown to a proper size for the materials we want for our several occasions in husbandry and building. I know of no other tree that will grow so well on such different soils as this will, for upon our sandy beaches, which are nothing but beds of sand, they grow as thick as possible, from whence many thousands of posts for fencing are brought into Pennsylvania and York governments; and I have seen, in a great miry swamp upon a branch of Susquehannah, great trees growing, near 18 inches diameter, 70 feet high, and very straight. And the inhabitants near the mountains, up Hudson River, make great use of them for making hovels or barracks to put their corn in before it is threshed. They will grow well in high gravelly or clay soil, in rich or in poor, or even upon a rock, if there be but half a foot of land or earth upon it. It is much to be

valued for its quick growth from seed, the little sap, and its durable heart, which it acquireth sooner than any tree that we can raise on common land. Indeed the mulberry and locust are of quick growth in very rich land, but not upon poor. A cedar tree, from the berry, will in 8 years be fit for hoops. * * * We may in this assist nature by art in carefully trimming them every three or four years, cutting the branches close and smooth off to the bole, so that these wounds may soon be closed which will make the tree smooth on the surface and the grain straight, which will be of great service if we make boards or rails of them, which will be much the better for being clear of knots. But if we let this tree grow without trimming, as it naturally shoots out branches on all sides in all the degrees of its growth, the lower ones die, but do not rot off near the boles, as in other trees, so that the sap can't close over them, but grows round, which makes the grain crooked, and instead of being straight and even it appears as if drove full of spikes, as we may observe by the posts, and especially the second cut, that are brought from the sea-coast where they grow naturally though not so tall or large as these beyond our northern mountains. * * * I am of the opinion that with care, ingenuity and industry we may make the very raising of them to a proper magnitude (exclusive of the value of them when cut down) to be easy, ornamental, and profitable."

In spite of Franklin's advice, practically no planting of cedars on a large scale has been done in this country and the search for new regions to exploit still goes on though the finest stands were cut long ago. The use of cedar has been very much accelerated by the demands of the pencil makers. For several reasons the heartwood of red cedar is in a class by itself when it comes to the making of pencils. It is soft, has a straight grain, is easily worked, yet is durable and attractive. Only the finest wood is used for pencils and the country has been searched and researched by the manufacturers.

Various substitutes have been tried out with only partial success. The Fabers established red cedar plantations in Germany some years ago and have been growing part of their

supply there. But though the red cedar has practically disappeared as a timber tree from much of its former range and though great rafts of the fragrant wood are no longer floated down the Mississippi, it is by no means exterminated. Along fence rows and roadsides, on dry limestone hills, and in deserted pastures its seeds are scattered by the birds. In these waste places it finds a foothold from which it will not readily be displaced.

NOTES

Dr. Edgar Anderson, in charge of School for Gardening, spoke before the second-class scouts of St. Louis, January 23, on "Winter Identification of Trees."

Mr. John Noyes, Landscape Designer to the Garden, attended the annual convention of the American Society of Landscape Architects, in Chicago, January 21-23.

Miss Fanny Fern Smith, Rufus J. Lackland Research Fellow at the Garden, was elected assistant secretary of the Phi Sigma Biological Society, at its annual meeting in Kansas City, December 28-31.

That the St. Louis public is becoming more interested in orchids was evidenced by this year's exhibition which has just closed with a total attendance of over 50,000. On Sunday, February 7, there were over 9,000 visitors, the largest number ever recorded at the orchid show for any one day.

Mr. G. H. Pring, Horticulturist to the Garden, spoke on "Orchid Hunting in South America" before the O'Fallon Park Protective Association, at the Pilgrim Lutheran Church, on January 6; and before the Good Fellowship Club of the Independent Evangelical Church, February 18.

Recent visitors to the Garden include Dr. E. M. East, professor of experimental plant morphology at the Bussey Institution of Harvard University, Jamaica Plain, Mass., and Dr. Hugo Weigold, Director of the Natural History Museum of the Province of Hannover, Hannover, Germany.

At the meeting of the American Association for the Advancement of Science, held at Kansas City, December 28-31, the following papers were given before the Botanical Society of America by members of the Garden staff: "A Statistical Study of Certain Taxonomic Characters" and "A Geographical Study of Variation in Two Species of Iris," by Dr. Edgar Anderson, Geneticist to the Garden and in charge of School for Gardening; "The International Congress of Plant Sciences," by Dr. B. M. Duggar, Physiologist to the Garden; and "Determination of Total Nitrogen in Plants and Plant Solutions: a Comparison of Methods with Modifications," by Emery R. Ranker, Rufus J. Lackland Research Fellow.

STATISTICAL INFORMATION FOR JANUARY, 1926

GARDEN ATTENDANCE:

Total number of visitors	23,453

PLANT ACCESSIONS:

Total number of plants received as gifts	160
Total number of seed packets received as gifts	40

PLANT DISTRIBUTION:

Total number of plants distributed	112

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	33
Total number of books and pamphlets donated	390

HERBARIUM ACCESSIONS:

By Gift—	
Braun, Miss E. Lucy—*Iris* sp. from Ohio	1
Dodge, Dr. Carroll W.—*Senecio Oerstedianus* Bentham from Costa Rica	1
Florists' Publishing Co. — *Polystichum munitum* (Kaulf.) Presl. from Oregon	1
Henderson, Professor L. F.—*Castilleja sp.* from Oregon	1
Sanson, N. B.—Compositae from Western Canada	107
Teas Nursery Co.—*Symplocos tinctoria* (L.) L'Herit. from Texas	5
von Schrenk, Dr. Hermann—*Pinus Mayriana* Sudw. from Arizona	1
Wolden, B. O.—*Senecio Hookeri* Torr. & Gray from Iowa	1
By Exchange—	
Field Museum of Natural History—Senecios from South America	2
New York Botanical Garden—Co-types and authentic specimens of West Indian plants	4
By Purchase—	
Bartholomew, Elam — North American Uredinales, Cent. XXXIV-XXXV, Nos. 3301-3500	200
Broadway, W. E.—Wood specimens of plants of Trinidad and Tobago	35
Elmer, A. D. E.—Plants of Philippine Islands	89
Total	448

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

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CAMELLIA THEA, BLOOMING IN ECONOMIC HOUSE AT THE GARDEN

Missouri Botanical Garden Bulletin

Vol. XIV MARCH, 1926 No. 3

TEA

The tea of commerce consists of the cured young and tender tips of a shrub which Linnaeus, a Swedish botanist, originally described under the name of *Thea sinensis*. Later botanists, however, referred the plant to Camellia and recognized two varieties, *Camellia Thea* var. *viridis* and *Camellia Thea* var. *Bohea*. From the variety *viridis*, a native of northeastern India, is derived the races of "Assam Indigenous" and "Manipur" as well as many other cultivated varieties widely grown in India, Ceylon, and Java. The Chinese tea, *Camellia Thea* var. *Bohea*, is the tea plant chiefly grown in southern China and is distinguished by its squat straggling habit and comparatively thick leaves. The "Assam Hybrid" is considered a natural cross between the "Assam" and China teas. In its natural state the "Assam" tea is an erect tree 30-40 feet high, but in cultivation it is "topped" early and kept as a bush averaging about four feet high.

Whether the original home of the plant is in the country naturally associated with it, viz., China, or in the neighboring Indian province of Assam is a question by no means settled. A Japanese legend ascribes the honor to China, but unfortunately there is evidence for supposing that the Chinese themselves never heard of the legend except from foreign sources. There are, however, certain references to the plant in the writings of a Celestial author who lived about 2700 B. C., and a Chinese commentator of this ancient author, writing in the fourth century B. C., calls attention to

the mention of the plant and adds that a beverage could be obtained from the leaves by adding hot water. It appears that the plant was used entirely as a medicine until 500 A. D. when it became a popular beverage. Inasmuch as the plant has been repeatedly found growing wild in Upper Assam and in the province of Cachar, De Candolle concludes that it unquestionably must be native to the mountainous region which separates the plains of India from those of China. Moreover, he regards the evidence sufficient to prove that the use of the leaves was introduced into India from China.

Its introduction into Europe is less obscure. There is a story which states that a package of a commodity hitherto unknown was received by an old couple in England during the reign of Queen Elizabeth, and that, instead of infusing the leaves and using the extract, they threw away the colored liquid and ate the leaves spread upon bread. Whatever may be said as to the probability of this story, it is definitely known that tea was introduced into Europe from China late in the sixteenth century, and that in 1657 a regular tea house was opened in Exchange Alley, London. From this date tea began to be used as a beverage in England. Pepys, in his "Diary" under the date September 28, 1660, writes: "I did send for a cup of tea (a China drink), of which I had never drunk before", and "Home and there find my wife making of tea, a drink which Mr. Pelling the Pothicary tells her is good for her cold and defluxions." About the same date as its introduction into England, the tea became known in Russia, having been brought to the ancient capital, Moscow, by an embassy to the Court of Pekin. In 1664 the famous English East India Company made a present of two pounds of tea to the queen of Charles II, Catherine of Braganza, and the product was still regarded as a rare delicacy. Fourteen years later the Company imported from China nearly 5,000 pounds and towards the end of the century tea had ceased to be a rarity.

The amount of tea consumed in all countries may be judged by the annual export from the tea-growing regions, which reaches approximately one billion pounds. Of this huge amount the British Empire is responsible for 350,000,000

FRUIT OF CAMELLIA THEA, SHOWING THREE SEEDED CAPSULE

JAPANESE WOMEN PLUCKING TEA

LEAF-ROLLING IN JAPAN

pounds, or nearly half of the world's production. India's export heads the list, with a valuation of $29,150,000, and is followed by that of China, valued at $27,500,000. In spite of this order of precedence however, it should be noted that the actual quantity of tea exported from China is three times as much as that of India, but the quality of the Chinese product is very inferior to the Indian article, and hence the difference in value. In Ceylon the export during 1873 amounted to 231 pounds, and in recent years reached the enormous amount of about 192,000,000 pounds. Japan is credited with an export of 150,000,000 pounds, Java with approximately 18,500,000 pounds, and Formosa with 18,000,000 pounds. During the last few years the import into England amounted to 255,112,000 pounds annually, followed by Russia, with about 126,000,000 pounds, and the United States with 81,389,000 pounds.

The rise in popularity of tea in England was comparatively slow up to the beginning of the seventeenth century. In 1711 the consumption per head was only .03 pound, and in 1780 it had risen to only .57 pound. During the first four decades of the next century the average stood at about 1.25 pounds, but after 1840, the period at which tea-planting was rapidly being extended in India, the consumption rose very quickly. In spite of the increasing consumption, however, tea has continued to fall in price, owing to the enormous increase in production.

With regard to the chemistry of the tea, the most important constituents from the point of view of the quality of the beverage are an essential oil, tannin, and a closely allied alkaloid known as theine. The flavor of the tea is largely due to the essential oil, but the remarkable stimulating and refreshing qualities of the drink are attributable to the theine, which is also found in coffee, Paraguay tea or maté, and the kola nut. Experiment has shown that an infusion of the leaf for ten minutes is sufficient to extract all valuable theine, and a longer period merely results in accumulation of tannin which, in excess, is well known to impede digestion seriously.

MODERN METHODS OF CULTIVATION AND MANUFACTURE IN CEYLON

The propagation of the plants is entirely by seed. These are sown in nursery beds, four inches apart each way, the beds being shaded by fern leaves, etc., fixed to the ground at an angle. In about ten months the seedlings are transplanted to their permanent position in the field about 4 or 5 feet apart. The plants have become well established and ready for picking when three years old, at which time they are sending out an abundance of young leaf-shoots, known as the "flush". When the bushes stop "flushing" they are pruned back severely, this being necessary at intervals of about fifteen to eighteen months in the low-country, or of three to four years in the up-country. This series of pruning keeps the plants within bounds to permit easy picking and gathering of the crop.

The flush is ready for picking every ten to twelve days, the young leaves and shoots, including about the fourth leaf back from the terminal bud, being plucked. The quality of the tea is dependent upon the size of the collected leaf. Thus, the plucking is designated as "Fine" when the bud at the top of the shoot and the two leaves just below it are taken, "Medium," the bud and three leaves, and "Coarse," when the bud and four leaves are picked. From the "Fine" plucking the tea known as "pekoes" are made, "flowery pekoe" from the youngest leaf, "orange pekoe" from the next youngest, and "pekoe" from the third leaf. "Souchongs" and "congous" are prepared from the larger leaves. "Pekoe-souchong," as the name indicates, is intermediate in quality between pekoe and souchong.

The crop is gathered by women who fill their baskets and take them to the factory to be weighed. The leaves are then carried to the upper floor of the factory, where they are thinly spread on light open-work shelves of canvas, or on wire-meshed trays, placed one above the other, in order that the drying or "withering" may take place. In good weather the correct degree of flaccidity is reached in seventeen or eighteen hours; but if the weather is damp, artificial heat is employed. The withered leaves are then collected from

WITHERING PROCESS, CEYLON

FERMENTING LEAF OF CEYLON TEA

TRUE PARAGUAY TEA AND A SUBSTITUTE GROWN AT THE GARDEN

the trays and thrown down through chutes into the rolling machines upon the ground floor. The object of the rolling process is to bruise the leaves, in order that the leaf juices may become mixed, and a twist or curl be imparted to the leaf. The rolling machine consists essentially of a table with a central depression to hold the leaf and a hopper above it, the two moving one above the other with an eccentric motion. Any required degree of pressure can be placed upon the mass of leaf that is being rolled, and at the end of about an hour the door in the bottom of the machine opens and the roll falls out. The twisted leaves, which have become somewhat yellowish, are clumped together in masses which are broken up in a machine called a "roll breaker". A "sifter," which separates the coarse leaf from the fine, is usually attached to the breaker.

The next process, the fermentation process, is one of the most important in tea manufacture, for on its efficient accomplishment depends to a large extent the quality and character of the tea. In the manufacture of "green" teas, which formerly enjoyed great popularity, this stage is omitted. In the preparation of black teas, however, the rolled leaves are piled in drawers or upon mats, one above the other, and left to ferment or oxidize, air being allowed free access. The process occupies a varying length of time according to the particular garden and weather conditions. During the fermentation the leaves emit a peculiar odor and change color. After about two hours, when the right degree of copper-brown color has been attained, the leaves are "fired" in drying machines, the heat arresting all further fermentation. In many factories the leaves are re-rolled previous to firing. Besides checking fermentation, the firing process removes all the moisture without driving out all the essential oil and other constituents upon which the value of the manufactured article depends. The firing is effected by one or more of many types of machines, all of which act by passing a current of hot, dry air through the damp fermented leaves until they are dry and brittle. A commonly used type of machine is the "Sirocco". After firing the tea is taken to the sorting room, where a machine consisting

of a series of moving sieves of different sizes of mesh separates it into grades. The resulting sievings are classed as Flowery Orange Pekoe, Orange and Pekoe No. 1, and "unbroken teas." The first is the finest tea, but the coarser tea is transferred to "breaking machines", and broken up and again sifted, the product being known as Broken Orange Pekoe No. 2, etc. The tea dust which accumulates during these processes is kept from the better qualities, and is shipped as "dust" and "fannings."

BRICK TEA

The chief manufacturing center of this kind of tea is at Si-Chuen, in Western China. It is a very cheap product of the industry and used by the Tibetans to the amount of twenty to thirty million pounds annually. Very little care is given in its manufacture, the main object being to obtain weight. In plucking, therefore, six to eight leaves are roughly stripped from the stems and in most cases the smaller twigs are also used. No withering or regular fermentation takes place, but both twigs and leaves are at once heated in thin iron pans for a few minutes and then tied up into bundles and sacks and taken to the factories. Here the tea is piled in heaps to ferment, after which it is dried in the sun, sorted into grades, steamed, and finally moulded into shallow bricks by the use of heavy hammers. Frequently a glutinous substance, such as butter or paste made from rice, is added in order to make it adhesive. Within a few days the bricks have become quite hard, and, being stamped with the maker's name and wrapped in paper, are ready for export to Tibet.

GREEN TEA

In the preparation of green tea the leaves are subjected immediately upon plucking to a process of steaming in revolving cylinders. Afterwards they are rolled, dried, etc., but the process of withering and re-rolling is omitted. China teas are usually made on this principle. The United States has been one of the largest users of green tea, but of later

years, with the popularizing of iced tea as a summer drink, the Ceylon or black tea is gaining in favor.

LEPPET OR LEPTET TEA

Leppet tea is a form of tea prepared only in Burma and in the Shan States, where it is used as a vegetable rather than a beverage. The tea leaves are preserved as in ensilage, and afterwards eaten mixed with garlic, salt, oil, and other ingredients.

SOLUBLE TEA

Of recent years, one of the Ceylon Government Chemists has perfected a process which reduces the tea to a fine powder or essence of tea, known as soluble tea.

PARAGUAY TEA

The yerba de maté, or Paraguay tea, is purely a South American beverage obtained principally from the leaves of one of the hollies, *Ilex paraguariensis*. Recently, however, two other plants which do not belong to the holly family, *Elaeodendron quadrangulatum* and *Symplocos lanceolata*, have been substituted for the maté. The true maté is a large shrub somewhat resembling the common tea, but its leaves are much larger, often measuring five inches in length, oval in shape, and deeply serrate along the edges. The plant is native to Paraguay and Brazil, where large plantations are under cultivation for its leaves.

The leaves are not cured in the same manner as the Ceylon tea. Instead, large leafy branches are cut from the plants and roasted on hurdles over a wood fire. They are then placed upon a hard floor where the withered leaves are beaten with sticks. After being reduced to a coarse powder in crude mills the tea is ready for packing in skins and leather bags. There are three grades of the South American product: (1) Caa-Cuys, which is made from the half-expanded leaf buds; (2) Cas-Miri, the unroasted leaf from which the principal veins have been removed; (3) Caa-Guaza, or yeba de palos of the Spaniards, which is prepared

from the roasted leaves, together with the leaf stalks and smaller twigs.

The beverage is prepared by putting a small quantity of the tea in a cup with a little sugar and pouring boiling water over it. When sufficiently cool the infusion is sucked up through a bombilla, a drinking tube with a wire network or perforations at the bottom. Maté has an agreeable, slightly aromatic odor, and a somewhat bitter taste. It is very refreshing and is a valuable restorative, especially after great physical exertion, while it also possesses mild diuretic and aperient properties. Over one million pounds of prepared maté are used annually in South America, and small quantities are also exported to Europe.

OTHER TEAS

Another species of holly (*Ilex vomitoria* Ait.), called yaupon or cassena, was the source of the famous "black tea" of the North American Indians. Cassine or cassena, in the language of the Timucua Indians, is the name of an exhilarating beverage prepared from the leaves.

The plant is native from Virginia to Florida, west to Arkansas and Texas. It is a shrub, rarely a tree, growing to a height of twenty-five feet, with spreading branches bearing oval or obtuse leaves about two inches long. The method of preparing the cassine was comparatively simple. The small leaves and tender shoots were carefully picked at the time of harvest in the fall. The leaves, after being dried, were roasted in ovens, remains of which may still be found in the Cherokee region. The roasted leaves were kept in baskets in a dry place until needed for use. An infusion of cassine leaves with boiling water gives a liquor of little taste and slight odor, but if boiled for an hour it becomes a very dark liquid somewhat resembling strong black tea and with an odor not unlike that of Oolong tea. The taste is similar to that of inferior black tea, quite bitter, but with little flavor.

There are several other lesser-known plants which are used in various parts of the world for the preparation of a refreshing drink. For example, in Australia, the plants of the

genus Leptospermum and Melaleuca have needle-like leaves which have been employed for tea making, but the beverage is not very palatable. The famous "Bushman tea" of South Africa is prepared from *Cyclopia genistoides*, and lemon grass is the source of an infusion which is drunk by natives of some of the inland districts of India.

The "Bourbon" or "Faham" tea is particularly interesting, inasmuch as it is obtained from an orchid, *Angraecum fragrans*, epiphytic upon trees in the forests of Bourbon and Mauritius. It is a small plant with cylindrical leaves which have a persistent vanilla-like odor. A specimen has been in the Garden collection for many years, usually flowering in the summer months. The beverage is prepared by pouring cold water on the dried leaves and boiling the liquid for about ten minutes in a kettle or closed vessel. It is then sweetened according to taste. The tea possesses an aroma of great delicacy and leaves a lasting fragrance in the mouth.

A NEW ORCHID FROM PANAMA

An interesting new species of Oncidium, *Oncidium fulgens* Schltr., was collected by Mr. C. W. Powell in the Chiriqui region of Panama, and a single specimen from the collection was presented to the Garden in July, 1924. Only two small bulbs constituted the entire plant upon arrival in St. Louis, and inasmuch as this represented the only specimen in cultivation outside of Mr. Powell's garden, special care was given to its culture. The orchid promises to be a good grower. Two bulbs have developed and a well-developed spike of lemon-yellow flowers barred with reddish brown in the center were produced from the new growth. At first glance the connoisseur might mistake this orchid for a very good specimen of *Oncidium flexuosum*, but the individual bulb character and leathery leaves indicate a new species.

Description.—Pseudobulbs ovate-compressed, two inches long, one inch wide, with one terminal and four lateral leaves, the basal two becoming deciduous with the full development of the pseudobulb, the lower portion forming

bracts. Inflorescence paniculate, two feet long, bearing seven branches, each possessing three to six yellow or yellowish brown flowers about three-quarters of an inch wide and one inch long. Sepals oblong-oblanceolate, rounded at the apex, slightly undulate, about one-half inch long, one-eighth of an inch wide, lemon-yellow barred with reddish brown at the base; lateral petals obovate, rounded or slightly emarginate at the apex, about half inch long and five-sixteenths of an inch wide, margins undulate, lemon-yellow barred with reddish brown at the base in the same manner as the sepals. Labellum three-lobed, the terminal lobe widely reniform, deeply emarginate, the slightly undulate margins the most conspicuous part of the flower, lateral lobes small, oblong-rounded at the apex, base of labellum crested, barred with the same reddish brown bands.

ONCIDIUM FULGENS

NOTES

Prof. A. T. Erwin, professor of horticulture, Iowa State College, Ames, Iowa, spent several days at the Garden recently, consulting the library.

Miss Fern Goss, student in the School for Gardening, spoke before the Better Homes Group of the Monday Club, Webster Groves, March 9, on "Garden Planning."

Dr. Otto Rahn, teacher of agriculture at Christian-Albrechts University, and on the staff of the Experiment Station for Dairy Industry, at Kiel, Germany, visited the Garden, February 19.

Mr. George H. Pring, Horticulturist to the Garden, gave an illustrated lecture before the science section of the Wednesday Club, February 24, on "The Effect of Smoke Upon Plants."

The third number of Volume XII of the Annals of the Missouri Botanical Garden, consisting of the fourteenth installment of "The Thelephoraceae of North America," has recently been issued.

The Cemetery Officials' Association of St. Louis visited the Garden, March 11, and were conducted through the buildings and grounds by special guides. After the tour Mr. Pring gave a talk before the members on "Landscape Gardening."

Dr. George T. Moore, Director of the Garden, has returned from a trip to Central America, having visited Cuba, Jamaica, Costa Rica, Honduras, and Panama. Dr. Moore secured a number of interesting additions to the Garden's collections of tropical plants.

STATISTICAL INFORMATION FOR FEBRUARY, 1926

GARDEN ATTENDANCE:

Total number of visitors	25,970

PLANT ACCESSIONS:

Total number of plants received as gifts	7
Total number of seed packets received as gifts	117

PLANT DISTRIBUTION:

Total number of plants distributed	3

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	20
Total number of books and pamphlets donated	259

HERBARIUM ACCESSIONS:

By Gift—	
Miller, Mrs. A. J.—From Horticulture	1
By Exchange—	
Epling, Dr. C. C.—Plants of Idaho	101
New York Botanical Garden—*Senecio* sp. from Panama	1
Rocky Mountain Herbarium, by Dr. E. B. Payson—Plants of Wyoming	283
University of Montreal, by Brother Marie-Victorin—Plants of Canada	415
U. S. Department of Agriculture, by Mrs. Agnes Chase—Grasses of Africa collected by Mr. David Fairchild	6
By Purchase—	
Bush, B. F.—Plants of Missouri	50
Grant, J. M.—Plants of Washington	250
Merrill, G. K.—Lichenes Exsiccati, Fasc. III, Nos. 51-75 inclusive	25
By Field Work—	
Chase, Mrs. Agnes—Grasses of Brazil	504
Total	1,636

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Missouri Botanical Garden Bulletin

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TYPES OF NARCISSUS GROWN IN ST. LOUIS, SHOWING CHARACTERISTIC FLOWERS AND FOLIAGE: A, NARCISSUS ODORUS (CAMPERNELLE); B, DOUBLE N. INCOMPARABILIS "GOLDEN PHOENIX"; C, N. INCOMPARABILIS "SIR WATKIN"; D, N. PSEUDO-NARCISUS MAJOR; E, N. PSEUDO-NARCISSUS BICOLOR "EMPRESS."

Missouri Botanical Garden Bulletin

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THE NARCISSUS

MYTHOLOGICAL AND HISTORICAL

The craving for explanations of natural objects and phenomena is by no means an offspring of our modern natural sciences, as we are so prone to regard it; but rather a progenitor of them. The explanation of the existence or habits of an animal or plant, offered by the ancient philosopher and poet in the form of fanciful myth, was prompted and executed in as earnest a vein as is the present-day scientist's account of its life history recorded with the aid of microscope and other technical apparatus in lieu of that more lovely but less accurate instrument, the imagination. Therefore, in studying such an interpretation, which we usually dismiss as only a "fable" and worthy of but superficial examination, we should not only regard its beauty, but accord it as much of the respect for which it was written as our sophisticated attention can allow.

One of the most beautiful of ancient myths concerns the origin of the narcissus flower. It is hardly to be believed that any one who has read the poetic tale in Ovid's "Metamorphoses" can have escaped its charm. Narcissus, the son of the river god Cephissus, was a youth of wondrous beauty, but haughty and cruel. His chief delight was in rendering admiring nymphs unhappy. Echo, a fair victim of his vanity, was turned into a rock by the pitying gods. Venus, however, warned him at the time that he would remain happy only until he should behold his own image. One day, weary and hot from hunting, he sought to quench

his thirst at a crystal fountain. Upon looking in the water, he beheld his image for the first time and was held spell-bound by its beauty. Not until he became completely enamoured of the reflection did he realize that it was his own. He became consumed with his self-passion, and, sleep and food forgotten, could but gaze into the water, and thus he pined to death. When the Naiads had prepared the funeral pyre, however, the body was missing, and they found in its place a golden flower bending over the stream dropping sweet beads of nectar into the reflecting water.

Another well-known tale is that Persephone was lured into the power of Hades by the sight of a clump of narcissi in a field where she was playing. The story is first told completely in the chronicles of Apollonius Rhodius, but reference to Hades as "Persephone's husband" is made in the Iliad. Jean Ingelow, in the last century, was particularly happy in poetizing the tale.

"She stepped upon Sicilian grass,
Demeter's daughter fresh and fair,
A child of light, a radiant lass,
And gamesome as the morning air.
The daffodils were fair to see,
They nodded lightly on the lea,
Persephone—Persephone!

"Lo! one she marked of rarer growth
Than orchis or anemone;
For it the maiden left them both,
And parted from her company.
Drawn nigh, she deemed it fairer still,
And stooped to gather by the rill
The daffodil, the daffodil."

The flower, from its twice-unhappy fame, became a symbol of sorrow in very early times. Wreaths of them were dedicated to Hades and placed upon the dead; the Fates were depicted with crowns of narcissi upon their heads. The cup in the center of the flower was fabled to contain the tears which the unhappy youth shed for his self-love. Milton referred to this tradition in "Lycidas," as follows:

"Bid Amaranthus all his beauty shed,
And Daffodillies fill their cups with tears,
To strew the laureat hearse where Lycid lies."

REPRODUCTION OF PLATE FROM PARKINSON'S "PARADISI IN SOLE. PARADISUS TERRESTRIS," SHOWING MISCELLANEOUS SPECIES OF DAFFODILS.

1 *Pseudonarcissus Hispanicus maximus aureus.* The great yellow Spanish bastard Daffodill. 2 *Pseudonarcissus Pyrenaicus major.* The Mountaine bastard Daffodill of Lobels kinde. 3 *Pseudonarcissus Hispanicus maior albus.* The greate white Spanish bastard Daffodill. 4 *Pseudonarcissus Hispanicus minor albus.* The little Spanish white bastard Daffodill. 5 *Pseudonarcissus tubo sexangulari.* The six cornere bastard Daffodill. 6 *Pseudonarcissus maximus aureus, flore Roseo.* [illegible] 7 [illegible] 8 *Pseudonarcissus Hispanicus aureus flore pleno.* The double spanish Daffodill, or Parkinsons double Daffodill. 9 *Pseudonarcissus Gallicus maior flore pleno.* The greater double French Daffodill. 10 *Pseudonarcissus Anglicus flore pleno.* The double English Daffodill, or Gerards double Daffodill.

I 3

REPRODUCTION OF PLATE FROM PARKINSON'S "PARADISI IN SOLE. PARADISUS TERRESTRIS," SHOWING SINGLE AND DOUBLE DAFFODILS.

Ancient authors frequently called narcissi "the flowers of deceit," because of their sweet but narcotic flowers, which charm with their beauty but had the reputation of producing stupor, madness, or even death.

Both Theophrastus and Dioscorides refer to the malevolent effects of the perfume and juices of the narcissus, but only the latter contrives to find some medicinal use for the plant. In his "Materia Medica," Book IV, it is recommended for the treatment of ulcers and spasmodic affections such as whooping cough and ague. Theophrastus limits himself to descriptive references to the plant in the "Historia Plantarum," Books VI and VII, but, strangely enough, takes no account of the traditions connected with it.

From the oldest printed herbal in the library of the Missouri Botanical Garden, the "Hortus Sanitatus" (1491), we receive very little information concerning the narcissus. Its only virtue is given as "warming to the stomach," but only when digestive ailments are unlikely. The wood-cut which accompanies the account is very poor, resembling cuts of several other plants in the book, especially that for Iris.

The advance of the art of herbal-writing in ninety years may be judged by consulting the "Kruydtboeck" of Matthias de L'Obel (1581). On page 147 we find cuts which actually resemble the narcissus, an innovation in the illustration of herbals, but the written account is still unsatisfactory. "This Narcissus is a plant of even length. In October it shoots up a white flower which is yellow in the centre; held up by a thin stalk. Clusius writes that it blooms around the river Guadina (Guadalquivir) at Granada. In Holland it is yet unknown."

The narcissus proved a "flower of deceit" indeed to the exponent of the Doctrine of Signatures. In the "Phytognomonica" (1588), Porta recommends it for ulcers "caused by serpents," because of the blisters which appear on the bulb, and because of the linear or serpentine leaves. It is not recommended highly for this use, however. Later, Helvetius (1750) includes it in his list of plants having the signature of the eye. Our good friend, William Cole, how-

ever, both in "Adam in Eden" (1657) and "The Art of Simpling" (1656) makes no claims whatever for the plant.

The Herbal of Matthiolus (1586) recapitulates the opinions of Dioscorides relative to the narcissus, with nothing new added. Five good plates are included, three of which, however, are not narcissi at all, one being a tulip, one a snowdrop, and one a grape hyacinth.

The year 1629 is well marked in the mind of every fancier of the daffodil, since it saw the appearance of John Parkinson's justly famous "Paradisus Terrestris." Here for the first time the plant receives very considerate attention, and because of its importance, the chapter dealing with the narcissus may well be quoted at some length, not only as illustrating the careful style of the author, but as furnishing an example of the use of Prelinnean polynomials in the naming of plants.

"There hath beene great confusion among many of our moderne Writers of plants, in not distinguishing the manifold varieties of Daffodils; for euery one almost, without consideration of kinde or forme, or other special note, giueth names so diuersely one from another that if any one shall receive from several places the Catalogues of their names (as I haue had many) as they set them down, and compare one Catalogue with the other, he shall scarse haue three names in a dozen to agree together, one calling that by one name, which another calleth by Another, that uery few can tell what they meane. And this their Confusion, in not distinguishing the name *Narcissus* from *Pseudonarcissus*, is of all other of this kinde, the greatest and grossest error." Then he divides the daffodils "into such a methodicall order" that euery one may know into which of two classes any form belongs, namely, into "*Narcissos*, true Daffodils, and *Pseudonarcissos*, bastard Daffodills."

With painstaking zeal he continues on what might be called his "*Pseudomonograph*": "Now to cause you to understand the difference between a True Daffodill and a false, is this; it consisteth onely in the flower (when as in all other parts they cannot be distinguished) and chiefly in the middle cup or Chalice; for that we doe in a manner onely

account those to bee *Pseudonarcissos*, bastard Daffodils, whose middle cup is alto-gether as long, and sometime a little longer then the outer leaues that do encompasse it, so that it seemeth rather like a trvunke or long nose, then a Cup or Chalice, such as almost all the Narcissi, or true Daffodils haue; I say almost because I know that some of them haue their Middle Cup so small, that we rather call it a crown then a Cup; and again, some of them haue them so long, that they seem to be of the number of the Pseudonarcissi, or bastard Daffodils; but yet they may easily be knowne from them, in that although the cup of some of the true Daffodils bee greate, yet it is wider open at the brim or edge, and not so long, and narrow all alike as the bastard kindes are; and this is the chief and onely way to know how to sever these kindes, which rule holdeth certaine in all, except that kinde which is called *Narcissus lancifolius reflexo flore*, whose cup is narrow, and as long as the leaues that turne vp againe. Secondly, I will subdiuide each of these again apart by themselves into four sorts; and first the *Narcissus* or true Daffodils into

Latifolius, broad leafed Daffodils,
Angustifolius, narrow leafed Daffodils,
Lancifolius, rushe Daffodils, and
Marinos, Sea Daffodils.

"These sorts againe do comprehend vunder them some other diuisions, whereby they may the better be distinguished, and yet still be referred to one of those foure former sorts; as

Monanthus, that is, Daffodils that beare but one flower; or two at the most vpon a stalke, and

Polyanthus, those that beare many flowers vpon a stalke as also

Simplici flore, those that beare single flowers, and
Multiplici flore, or *flore pleno*, that is, haue double flowers.
Vernales, those that flower in the Spring, and among them some that are earlier, and therefore called
Praecoces, early flowering daffodils, and
Autumnales, those that flower in Autumne onely.

"And lastly with the *Pseudonarcissus* or bastard Daffodils, I will keepe the same order to distinguish them likewise, unto their forme, seuerall sorts. . . . To begin there-

fore, I thinke fittest with that stately Daffodill which for his excellency carrieth the name of None Such.'' And therewith follows the description of four sorts of what we now know as *Narcissus incomparabilis*, but which then, because of the extensive artificial subdividing, bore the awesome polynomial of ''Narcissus latifolius omnium maximus amplo calice flave sive nonpareille (the great None Such Daffodill, or Incomparable Daffodill).''

As is evident from the above quotation, which may appear excessive but which is truly important in a historical treatment of the daffodil, Parkinson's descriptions become almost painfully painstaking, and we are surprised indeed when he falls into the error of Matthiolus in including a Crocus and a Hippeastrum (which he allows to be a ''strange sea daffodill'') with his narcissi. In all, he gives nine excellent plates containing practically all the main species now known, as well as the two ''exotics'' mentioned above. Although Crocus and Hippeastrum may have deceived him, he at least succeeded in relegating Tulipa, Scilla, and Muscaria from their previously unchallenged places as *bona fide* Narcissi to their proper categories, as well as clearly outlining the gross morphology of the Narcissus in classification. In arriving at the ''Paradisus Terrestris,'' we reach debated ground, for although the atmosphere of the work is medieval from the picture of the Vegetable Lamb on the title-page to the decorated ''Finis'' at the end, here we perceive a definite change from man's earlier interpretation of Nature by means of myth and philosophical speculation to the spirit of modern explanation by observation and experiment.

DAFFODIL, JONQUIL, OR NARCISSUS, WHICH?

There is no more certain way of starting a discussion among amateur gardeners than to ask ''What is the difference between a daffodil and a jonquil?'' For though jonquils are seldom grown in this country and few people have actually seen any, nearly every one has his own idea of what they look like, and rarely does it happen that any two persons in one company are of the same opinion on the subject. Should you, however, have the unusual experience of finding three

gardeners who can agree on a definition, one question will serve to revive the discussion, "What is the difference between a daffodil and a narcissus?"

Let us answer the last question first. The term narcissus is scientific as well as popular. As a scientific name it refers to the whole group of plants which we call by the popular names, daffodil, jonquil, poets' narcissus, and paper-whites. All of these belong to the genus Narcissus and the term may very properly be used to refer to any one of them. In other words, all daffodils and jonquils are Narcissi but not all Narcissi are jonquils or daffodils. As a popular term, however, it has often been restricted in England to the poets' narcissus and similar forms, and that custom has sometimes been followed in this country.

As a group, the Narcissi (taking the term in its broadest sense) have so many striking characteristics, that it is easy to distinguish them from other flowering plants. They are all low-growing bulbous plants, the tallest kinds barely exceeding two feet. All of those in cultivation are spring flowering; their flowers, borne on leafless stems of about the same height as the leaves, are yellow or white, in some forms marked with reddish or orange. Their most striking feature is the crown or corona, a petal-like outgrowth from the center of the flower. It varies from the long trumpet of the common daffodil to the shallow cup of the poets' narcissus and is well shown in plate 22.

The first question is even easier to answer. Though their flowers are distinctive, daffodils and jonquils are most readily distinguished by their leaves. Those of daffodils are much wider than thick, while those of jonquils are of about equal dimensions each way. The twenty or more species of Narcissus can be divided into two groups on this basis, the daffodils and other species with similar leaves forming the "flat-leaved" or "grass-leaved" narcissi; while the jonquils and the other round-leaved species are known as the "rush-' leaved" narcissi. As has been said there are many other differences between jonquils and daffodils, and there is really no cause for confusion. Jonquils are very sweet-scented. Their odor is more like that of paper-white narcissi (though

not as sickening) than it is like that of daffodils. Furthermore, their flowers are smaller, are usually borne in clusters of two or three, and are of a brighter yellow than daffodils.

When we leave the question of what differentiates a daffodil from a jonquil and try to distinguish the separate species of Narcissus, we find it a difficult if not an impossible task. The species are very variable and it is hard to tell where one leaves off and another begins. There are numerous intermediate forms between the outstanding types. Sweet, the British botanist, died in the madhouse, the result, it is said, of trying to straighten out the species of Narcissus. Nearly all of the species will cross with each other if given the opportunity, and many botanists believe that this has occurred in nature and is responsible for much of the confusion that exists. When we leave the wild species and attempt to classify the garden forms, the confusion is even greater. The original types have been crossed and recrossed to such an extent that they can no longer be recognized. In 1909 the Royal Horticultural Society of England took the matter in hand and after several preliminary attempts developed an artificial classification which has been largely followed since that time. Though it does not adhere throughout to botanical relationships and though forms of very different ancestry are sometimes brought together under one heading, it has been found of great practical convenience in classifying garden forms. It divides the genus into eleven divisions as follows:

DIVISION I. Trumpet Daffodils.

Distinguishing character. Trumpet or crown as long as or longer than the perianth[1] segments.

Here belongs the common daffodil, *Narcissus Pseudo-Narcissus*, which grows wild in Europe from the Scandinavian peninsula to Spain and Roumania. In England the wild daffodils are often referred to in country districts as Lent Lilies. This division is subdivided on the basis of flower color.

[1] The term perianth used in these descriptions is a general term for the outer whorls of the flower and includes the petals (corolla) and sepals (calyx). In Narcissus there is usually little or no difference between petals and sepals.

TYPES OF NARCISSUS

PSEUDO-NARCISSUS VAR. MAJOR (SINGLE DAFFODIL).

PSEUDO-NARCISSUS VAR. FLORE PLENO (DOUBLE DAFFODIL).

TAZETTA VAR. PAPYRACEUS (PAPER-WHITE).

JONQUILLA (TRUE JONQUIL).

TYPES OF NARCISSUS

TRIANDRUS
(ANGEL'S TEARS).
ODORUS VAR. HEMINALIS
(CAMPERNELLE).

INCOMPARABILIS
(NONE-SUCH).
BULBOCODIUM CORBULARIA
(PETTICOAT DAFFODIL).

(a) varieties with yellow or lemon-colored trumpets and perianth of the same shade or lighter (but not white).

(b) varieties with white trumpet and perianth.

(c) bicolor varieties, i. e., those having a white or whitish perianth and a trumpet colored some shade of yellow. These are the varieties which have been aptly described as "apples of gold in baskets of silver."

DIVISION II. Incomparabilis.

Distinguishing character. Cup or crown not less than one third, but less than equal to, the length of the perianth segments. Here belongs *Narcissus incomparabilis,* found wild in Spain and southern France, and a number of garden hybrids of similar form. They are of diverse ancestry, the results of crosses between trumpet daffodils and poets' narcissus. Like the trumpet daffodils they are subdivided on the basis of color:

(a) yellow shades with or without red coloring in the cup.

(b) bicolor varieties with white or whitish perianth and self yellow, red-stained, or red cup.

DIVISION III. Barrii.

Distinguishing character. Cup or crown less than one-third the length of the perianth segments. Garden hybrids of various ancestry, mainly crosses between poets' narcissi and trumpet daffodils or incomparabilis.

DIVISION IV. Leedsii.

Distinguishing character. Perianth white and cup or crown white, cream, or pale citron, sometimes tinged with pink or apricot. Embracing all sizes as found in the incomparabilis and Barrii divisions.

DIVISION V. Triandrus hybrids.

Distinguishing character. All varieties obviously of *N. triandrus* ancestry, such as Queen of Spain, etc.

[*Narcissus triandrus* is a small, nodding daffodil found wild in the mountains of Spain and Portugal, where it grows between clefts in the rock. Because of its nodding flowers it

is commonly known as "Angel's Tears." The leaves are rush-like, the flowers are small, their perianth is reflexed and gives the flower somewhat the aspect of a fuchsia or a cyclamen. Hybrids between them and the larger narcissi retain somewhat of the grace of the wild form and are commonly grown from seed in England.]

DIVISION VI. Cyclamineus hybrids.

[*Narcissus cyclamineus*, as its name would indicate, is another wild species with reflexed perianth. It is a tiny form, six inches high at the most, with small drooping flowers of a rich, shiny yellow. Its hybrids are distinguished by drooping flowers and globular cups.]

DIVISION VII. Jonquilla hybrids. *N. odorus.*

[The true sweet-scented jonquil, *Narcissus Jonquilla*, described below, has been crossed with *N. Pseudo-Narcissus* to produce a race of larger-flowered forms. Similar forms long known as *Narcissus odorus* have been found growing wild in southern Europe and are considered by many botanists to be natural hybrids. All these forms are known to gardeners as Campernelle jonquils, or simply campernelles. They are early blooming, producing two or more fragrant flowers on each stalk.]

DIVISION VIII. Tazetta and Tazetta hybrids.

[*Narcissus Tazetta* is the exceedingly variable species to which belong most of the "bunch-flowered narcissi," the paper-whites, the Chinese sacred lily, and other forms having numerous small flowers clustered at the end of slender stalks. With them are grouped the poetaz varieties (hybrids with the poets' narcissus) and other hybrid forms.]

DIVISION IX. Poeticus varieties.

The poets' narcissus, *Narcissus poeticus*, and its several varieties.

DIVISION X. Double varieties.

Here are lumped together all the double varieties of Narcissus. In some of them the doubling is mainly of the

trumpet and the perianth remains normal, in some the perianth is also doubled. Most of these forms are of very ancient origin. The following are a few of the commoner sorts:

Double Van Sion or Telamonius plenus. This very ancient type is found wild in southern Europe. It is the common double daffodil, sometimes erroneously called jonquil, found in old American gardens. It is very vigorous and free-flowering and can be seen every spring by the thousands around several of the older homes in St. Louis County. In this country it displays an annoying tendency to produce flowers streaked with green.

Queen Anne's Double Daffodil or Capex Plenus. The flower has no trumpet and the perianth is composed of six superimposed layers of petals, each one a little smaller than the one below it.

Orange Phoenix, Golden Phoenix, and Silver Phoenix. Often called in England by the country names of Eggs and Bacon, Butter and Eggs, and Codlings and Cream, respectively. These are double forms of *N. incomparabilis*, differing in the shade of the flowers.

Double Poets' Narcissus. Often called the gardenia-flowered narcissus.

Double Jonquil. A double form of the true jonquil, which is described in the next section.

Queen Anne Jonquil. This is a double form of the Campernelle jonquil of Division VII.

DIVISION XI. Various.

Here are included all the forms which do not come under any of the above headings. It is mainly composed of wild species, *N. triandrus* and *N. cyclamineus*, already described, and *Narcissus Jonquilla*, the true jonquil. It is distinguished from the Campernelle jonquils by its smaller size and its relatively smaller cup which is much less than half the length of the perianth segments. Here also belongs the dainty little *Narcissus Bulbocodium*, the hoop-petticoat daffodil, so called because of its widely flaring corona.

Though there are many varieties of narcissus, few of them are seen in this country. In Europe the flower has been culti-

vated since very early times. The Reverend Joseph Jacob says of its history as a garden flower:

"The poets of ancient Greece and Rome sang its praises two thousand years ago; the bunch-flowered form (*N. Tazetta*) was in all probability cultivated in Egypt a hundred years and more before the birth of Christ, and it was used then, as it is today, in funeral ceremonies. * * * * At the same time it is a new flower, inasmuch as the lovely forms which are now the commonplaces of the garden and show table were undreamed of fifty years ago. One has only to remember that in Glenny's 'Properties of Flowers and Plants' no other Narcissus or Daffodil is thought worthy of mention but the Tazetta or 'Polyanthus.'

"The last and by far the most interesting stage in the life-history of the Daffodil began in the forties when Dean Herbert of Manchester, in order to find out which varieties he should class as natural species, crossed for his own satisfaction, 'a trumpet with a poet' and produced a flower (*incomparabilis*) intermediate between the two. Then came the days of Backhouse and Leeds who in their leisure hours busied themselves with hybridizing and raising seedlings with the result that pretty well all the first generation of new and beautiful garden forms were their seedlings. One wonders what might have been the fate of these early, garden-raised seedlings had not they been taken in hand by Peter Barr, and through his instrumentality distributed to the garden world. Peter Barr in no figurative sense, made the Daffodil. He travelled for it, he worked for it; he classified it, he advertised it. * * * * The send off of Daffodils as we now know them was the Daffodil conference of 1884. This event more than anything else sent the ball rolling. Before twelve months were past Peter Barr had arranged in systematic order all the known varieties, and his firm, in conjunction with Mr. F. W. Burbidge, had published 'Ye Narcissus, a Daffodyl Flowre and hys Roots, with hys culture & &' and Mr. Hartland of Cork had issued the first catalogue devoted entirely to Daffodils ever published."

The interest thus started increased from year to year. The numbers of named varieties mounted into the thousands. The

first show exclusively for daffodils was held in Birmingham in 1893. By 1910 eighteen British cities were holding such exhibitions annually and daffodil societies were springing up throughout the empire. The craze was just reaching a peak when checked by the World war. At that time enthusiasts were paying as much as two to three hundred dollars for single bulbs of new varieties and sturdy Britons were being turned from pheasant shooting to daffodil raising. One enthusiastic aristocrat wrote: "I always thought a real good shoot or a good salmon river, with plenty of water in it, about the top of the tree for enjoyment, but I am beginning to think that I look forward to my visit to the Birmingham Daffodil Show more than any thing in the year."

CULTURAL DIRECTIONS

The various garden forms of Narcissi are among the best subjects for the spring garden. They are hardy and reliable, standing frost even after they have come into flower, and are equally effective outdoors or as a cut flower. They have a long blooming season, two months elapsing between the earliest of the yellow trumpets and the last of the poets' narcissi. Once planted they will bloom for many years without further attention and their culture is extremely easy. Formerly within the reach of every householder, the restrictions enforced by the Federal Horticultural Board has cut off the main source of supply and made all but the very common sorts a rich man's luxury.

While narcissi prefer a light sandy loam, they will give good results in our heavy clays, particularly if a little sand is filled in about the bulb when planted. They may be put in the ground any time between July and October but the sooner the better, as the bulbs do not keep well when exposed to the air. The general rule for all varieties is to plant them six inches apart and to have the top of the bulb three inches below the surface of the ground. If the soil is heavier, however, the bulbs need not be planted so deeply, and if it is lighter they should be planted deeper. With small-bulbed sorts the distances apart and the depth of covering need to be decreased. When in doubt plant them deeper, as it will do the bulbs no harm, and will merely make them come into

flower a little later. Bulbs have been known to flower successfully when covered with nearly two feet of earth.

The smaller sorts are easily planted with a dibble, a pointed stick a little larger in diameter than a broom handle. If many bulbs are to be planted, it is a convenience to have one made from an old spade or shovel handle with a cross bar six inches from the point for the foot. When bulbs are being planted in the grass the dibble may be used, or a slant-wise cut may be made with the spade and several bulbs inserted.

One caution only needs to be given. Do not use manure, particularly fresh manure of any kind, as the bulbs are very sensitive to it. It is best not to use manure even as a mulch, though this is often done without injury if it is removed early enough in the spring. The very best mulch is marsh hay, but if this is not obtainable, leaves weighted down with a few branches, or sphagnum moss or cocoanut fibre may be substituted. The bulbs may, in fact, be left without any mulch, although the smaller and shallower-planted sorts will sometimes be injured in the alternate freezing and thawing to which the ground is subjected.

Narcissi are particularly at home when grown in the grass. That is where they grow naturally, and if the grass does not need to be mowed until after their leaves mature, they will care for themselves without further attention. All of the hardy kinds can be used; the trumpet daffodils for well-drained slopes and poets' narcissi for the heavy wet soil of pond margins. If more than one kind is to be used, each kind should be planted separately, otherwise an unpleasant, spotty effect is obtained. Narcissi are most effective when planted in bold, irregular clumps of 25 to 100 with a few outlying individuals.

VARIETIES FOR THE HOME GARDEN

The following are all standard, reliable varieties, comparatively low in price:

Autocrat (Incomparabilis). Rich yellow, cup very wide at the mouth, tinged with red. Early.

Beauty (Incomparabilis). Perianth light yellow, cup deeper yellow, shaded with reddish orange. Splendid cut flower. Naturalizes well.

EMPEROR (Trumpet). The standard, all-yellow trumpet. Old and reliable.

EMPRESS (Trumpet Bicolor). Perianth sulphur-white, trumpet rich yellow. Dependable for naturalizing, forcing, or growing in the garden border.

SEAGULL (Barrii). Perianth pure white, cup pale yellow edged with orange.

RUGULOSUS (Hybrid Jonquil). The best of the Campernelles. Fragrant, free-flowering. Naturalizes well.

SIR WATKIN (Incomparabilis). One of the largest of this section. Free bloomer. Very early.

WHITE LADY (Leedsii). Perianth white, cup pale canary-yellow.

VAN SION (Double Trumpet). Sometimes called Telamonius plenus. Standard for forcing. Naturalizes well, though flowers are often streaked with green.

Many narcissi are well adapted for forcing for winter bloom in the house; the paper-white being one of the easiest to handle. For cultural directions see the article on "Bulbs for the Home" in the October, 1922, number of the BULLETIN.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke before the Women's Round Table dinner, March 18, on "Conservation."

Dr. B. M. Duggar, Physiologist to the Garden, presented a paper before the Botanical Society of Washington, April 6, on "Some Recent Studies on the Virus of Tobacco Mosaic."

Recent visitors to the Garden include the University of Illinois Library School, April 9; and Professor Yoshiji Yoshii, professor of plant physiology, Biological Institute, Tohoku Imperial University, Sendai, Japan, on April 10.

Dr. Edgar Anderson, Geneticist and in Charge of the School for Gardening, spoke before the members of the Garden Club of Springfield, Illinois, March 23, on "Flower Forms and Their Meaning;" and on April 2 addressed the Nature Study Society of Webster Groves, on the same subject.

Dr. Anderson assisted as an instructor at the National Girl Scouts training course at Irondale, Missouri, April 15-17.

The fourth number of Volume XII of the Annals of the

Missouri Botanical Garden has recently been issued with contents as follows:

"The Effect of Treating the Virus of Tobacco Mosaic with the Juices of Various Plants." B. M. Duggar and Joanne K. Armstrong.

"Determination of Total Nitrogen in Plants and Plant Solutions: A Comparison of Methods with Modifications." Emery R. Ranker.

"Colloidal Sulphur: Preparation and Toxicity." Lionel E. Tisdale.

STATISTICAL INFORMATION FOR MARCH, 1926

GARDEN ATTENDANCE:

Total number of visitors	8,231

PLANT ACCESSIONS:

Total number of plants received as gifts	3,025
Total number of seed packets received as gifts	180

PLANT DISTRIBUTION:

Total number of plants distributed	6

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	44
Total number of books and pamphlets donated	213

HERBARIUM ACCESSIONS:

By Gift—

Collins, J. Franklin — Gymnosperms, mostly from Rhode Island	21
Howe, T. D.—*Liatris acidota* Engelm. & Gray, var. *mucronata* (Engelm. & Gray) Gray, from Nebraska	1
Kellogg, John H.—Plants of Horticulture	2
Powell, C. W.—Plants of Panama	18
Pring, George H.—*Oncidium fulgens* Schltr. from Panama	1

By Purchase—

Plants of Trinidad and Tobago	100
Holzinger, John M.—Musci Acrocarpi Boreali-Americani et Europaei, Fasc. XXIII, Nos. 551-575, incl.	25
Seymour, Frank C.—Mexican Gulf Coast Flora, Cent. I, Nos. 1-100, incl.	100
Weigel, Th. Oswald—Plants of Papuasia (Kaiser Wilhelmsland)	100

By Exchange—

Arnold Arboretum of Harvard University—Plants of the United States, collected by E. J. Palmer	1,600
Bailey, Dr. L. H.—Plants of Venezuela	21
Rose, Dr. J. N.—*Senecio eriophyllus* Greenman, from Mexico	1
Total	1,990

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas — week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Aquatics

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Inside Floral Display

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Herbaceous and Nursery

H. VALLENTINE,
Carpenter

Missouri Botanical Garden Bulletin

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1926

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SPECIMEN OF RIVER BIRCH, NEAR NEW ATHENS, ILLINOIS

Missouri Botanical Garden Bulletin

Vol. XIV MAY, 1926 No. 5

THE RIVER BIRCH

A Native Tree of Promise for the Smoke Zone

In Saint Louis the one question which outweighs all others when the garden value of any plant is being considered is, "How will it stand the smoke?" Because of smoke conditions we grow hardy four-o'clocks instead of lilies, and however much we may enjoy the fragrance of conifers we tolerate in their stead the malodorous Ailanthus. For this reason the river birch, *Betula nigra* L., seems worthy of a more extended trial in Saint Louis. Like the sycamore and the silver maple, the river birch is native to the bottomlands of the Mississippi Valley, but, unlike them, it has not been generally used for city planting. There are several trees at the Garden and one or two here and there in the city parks, but with these few exceptions it seems to have been overlooked by our gardeners. Yet it has done uniformly well in these situations and has proved hardy north of its natural range, nor has the Saint Louis smoke affected it as it has many of our native trees. The group in the North American tract is healthy and vigorous. Measurements made this winter show that the smaller saplings planted a few years ago near the Director's residence are growing as rapidly as the trees of the same age in Saint Louis County.

The technical botanical description is as follows:

Tree to 90 feet in height, trunk occasionally reaching a diameter of 5 feet; branches slender, pendulous; bark on trunk and larger limbs very dark brown, in large granular-surfaced flakes, that on branches lustrous, reddish brown to cinnamon-red, separating naturally in ragged, curly sheets, wood close-grained, light, and strong, heart-wood scarcely differentiated; leaves alternate, lustrous, dark

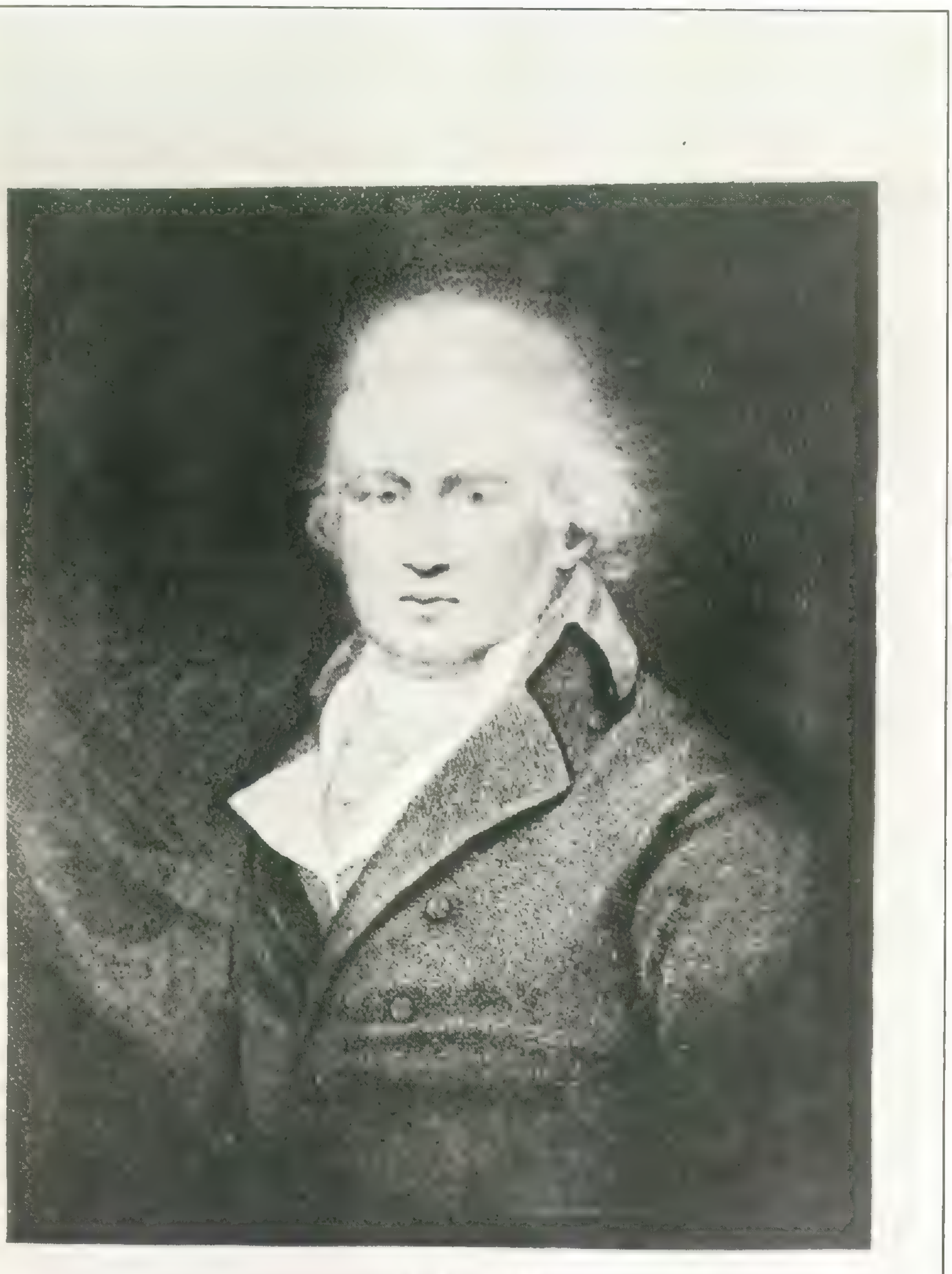
green above, whitish beneath, coarsely and irregularly biserrate, acuminate-pointed, cuneate at the base, downy beneath when young; petioles short, pubescent; flowers appearing before the leaves; staminate catkins in three's, distillate catkins erect, short, soft-downy, peduncled; fruit ripening in May or June of the first year.

More striking than any of these technical points is the picturesque aspect of the tree, perhaps too much so for general planting. The trunk, in young trees, is narrow and divides into a few gracefully curved branches. These are slender and supple, clothed along most of their length with the ragged, papery bark whose color has lent the name of red birch to the species. It is probably too limber for a street tree, though an avenue on a private estate would be an interesting experiment. Like most birches, it is little damaged by snow and ice, bending under its load instead of breaking.

Although the river birch thrives in gardens and is the only birch which takes kindly to warm climates, it is found wild only along river banks, pond margins, or in wet swamps. It occurs scatteringly along the Atlantic coastal plain from the Merrimac River in New Hampshire and Massachusetts, southward, and in the bottomlands of the Mississippi River system. At its western limits, along the upper branches of the Missouri, it becomes dwarfed and scrubby; southward it grows more luxuriantly, probably reaching its best development in the Red River country in Arkansas. Locally it occurs here and there along our smaller water courses, probably the nearest to the city being the mutilated specimen close to the North and South road just outside the town of Clayton. It is found scatteringly in the vicinity of Barnhardt, Mo., and is very abundant along the Meramec River at Allenton. The finest grove known to the writer is on the banks of the Kaskaskia River just outside the town of New Athens, Illinois, where there are several very large specimens (pls. 27-28) and forty or fifty younger trees.

Although the species is nowhere plentiful, it will probably always remain with us. In the first place it is a tree of the waste lands, growing on the very edge of the rivers, and therefore is least likely to be cut down when the land is cleared. Secondly, though the wood is usable it has no out-

TRUNK OF LARGE RIVER BIRCH, NEAR NEW ATHENS, ILLINOIS



WILLIAM COBBETT

From an engraving by F. Bartolozzi, R.A. after a painting by [illegible]

standing qualities to make it particularly sought after. It is used in the manufacture of wooden kitchen-ware, picnic plates, and the like, by furniture makers for the sides and backs of drawers, and as a foundation for veneers of more beautiful woods. Probably the only special use is that recorded by Michaux: "In Philadelphia its twigs are exclusively chosen for the brooms with which the streets and courtyards are swept, which are similar to those employed for the same purpose in Paris. The twigs of the other species of birch, being less supple and more brittle, are not proper for this use."

Considering the tree as a whole, it does not deserve to remain what it is at present, the least known of our native trees. For, as Michaux observed in his "North American Sylva," "if the good properties of the birch are not brilliant, they are at least numerous and useful."

THE STORY OF WILLIAM COBBETT, PLANTSMAN AND PAMPHLETEER

Among books recently acquired by the Garden library is a copy of "The Woodlands," by William Cobbett, a figure as striking in horticulture as in all the diverse activities into which he thrust himself. He was a man of whom his biographer, Lewis Melville, could write, "If there has lived anyone with a more goodly conceit of himself than William Cobbett, more convinced of his virtues as a man, more satisfied with his achievements as a politician, and more delighted with the effects of his writings, history has failed to record his existence. In the realms of vanity, albeit it must be remembered that there was in him a substratum of sound common sense, it is verily William Cobbett first and the rest nowhere."

Although self-educated, he became one of the greatest English politicians of his day, a fiery champion of the poor and the oppressed, a publicist, who spared no one and attacked friend and foe with equal vigor. With boundless energy he wrote book after book, on English Grammar, Travel, Horticulture, History, Ethics, the Use of Horse-drawn Cultivators, Religion, Geography, Dendrology, and Political Economy. With a conceit equally boundless he could say of these books,

the main ones of which he expansively dubbed "The Cobbett Library," "When I am asked what books a young man or young woman ought to read, I always answer, let him or her *read all the books that I have written.*"

Cobbett was born in 1763, the son of a Surrey farmer. A local gardener having kindled his imagination with tales of the wonderful gardens of the King, he ran away from home at the age of eleven, and made his way to Kew on foot. In one of his autobiographical sketches he tells of his reception there, "The singularity of my dress, the simplicity of my manner, my lively and confident air, and doubtless his compassion besides, induced the gardener, who was a Scotchman, to give me victuals, find me lodgin, and set me to work; and it was during this period that I was at Kew that George IV and two of his brothers laughed at the oddness of my dress while I was sweeping the grass plot round the foot of the Pagoda. The gardener, seeing me fond of books, lent me some gardening books to read."

Upon his return home shortly afterward, he enlisted in the army and saw service in New Brunswick. In the army he advanced rapidly in spite of his conceit and his unwillingness to overlook the corruption and graft which he found there. He was offered a commission, but preferred to resign and return to England where he spent time and energy in a disastrous attempt to have his superiors prosecuted for graft Having long been interested in the affairs of the American colonists, in 1792 he set sail for Philadelphia with his young bride, and offered his services to the American government. He was unable to obtain anything sufficiently remunerative from them, however, and set himself to teaching English to French immigrants, and was soon making a comfortable living. But his fingers itched for the pen, and a number of pro-English pamphlets published under his *nom-de-plume* of Peter Porcupine made him extremely unpopular. The climax of his American career came when he proceeded to attack Dr. Benjamin Rush, saying, "Can a Rush grow without mire?" Rush was successful in a libel suit against him, and Cobbett eventually yielded to the advice of friends to return to England.

THE WOODLANDS:

OR,

A TREATISE

On the preparing of ground for planting; on the planting; on the cultivating; on the pruning; and on the cutting down of Forest Trees and Underwoods;

DESCRIBING

The usual growth and size and the uses of each sort of tree, the seed of each, the season and manner of collecting the seed, the manner of preserving and of sowing it, and also the manner of managing the young plants until fit to plant out;

THE TREES

Some arranged in Alphabetical Order, and the List of them, including those of America as well as those of England, and the English, French, and Latin name being prefixed to the directions relative to each tree respectively.

BY WILLIAM COBBETT.

TITLE PAGE FROM WILLIAM COBBETT'S "THE WOODLANDS"

In England he plunged anew into agitation and controversy, writing continually and furiously, and eventually landed in prison in 1810, where he remained two years. His many enemies hounded him in financial as well as in political ways, so that in 1817 he came again to America to escape his creditors. On this visit he spent two years in the country and traveled as far west as Vincennes, Indiana. His journal of this visit, published under the title of "A Year's Residence in the United States of America," treats in an interesting manner of the crops, climate, customs, and vegetation, of the country at that time. In 1819 he returned to England, taking with him the bones of Thomas Paine, the free-thinker. He busied himself characteristically in many things, but the tide of his fortune had turned and though he made many enemies he also made many friends. He was tried for sedition in 1831 but was acquitted and was elected to the House of Commons a year later. There he fought so valiantly for his "beloved poor" that he brought about his death in 1835 from over-exertion. He died as he had lived, fighting fearlessly, asking quarter from no one, sparing not even his friends. "Let them write on till their own pens are worn to the stump; let them fire their balls at my reputation, till the very press cries out murder. If ever they hear me whine or complain, I will give them leave to fritter my carcass."

To gardeners he is of particular interest for two reasons: his introduction of American trees into England, and his description of the farms and gardens of America at the time of his second visit. His exploitation of the American locust has been mentioned in the November, 1925, number of the BULLETIN. He sincerely believed that our locust was superior to any of the trees then grown in Britain and set about with characteristic energy to popularize it, writing in his treatise on woodlands, "I believe that I know as much on this subject [the growing of locust trees] and perhaps more than any man in the world. I shall make it as easy to the reader as the rearing of cabbages and turnips; and that, too, at an expense so moderate as to make it next to impossible for any gentleman who has the seed to refrain from cultivating this tree upon as large a scale as his possessions will

permit.'' His persistent advocacy brought the tree into favor, but, unfortunately for England, his predictions as to its rate of growth did not materialize.

He made an unsuccessful attempt to interest the British public in Indian corn, but, like Ralph Waldo Emerson and Herbert Hoover at later dates, he failed to convince them that it was meant for human food. He published a number of his journal, ''The Register,'' on paper made from corn husks, and even established stores where flour and bread made from Indian corn might be purchased. For these efforts the Society of Arts presented him with its silver medal in 1823, but the great British public characteristically kept to its old ways.

He also wrote widely on American plants in general and on American trees in particular. He grew a number of these at his home in Surrey, recommending, among others, the American white ash as superior to the British. Its seed, he declared, ''could be germinated the first year with just as much ease as an onion or radish seed.''

His descriptions of American farms, gardens, and forests, in the year 1818 are very delightful reading. His versatile nature was interested in so many different features of the life around him that, on reading his journal, one is reminded of Darwin's ''Voyage of the Beagle.'' The following extracts are typical:

[Long Island—1817.] ''The fences are of post and rail. This arose in the first place from the abundance of timber that men knew not how to dispose of. It is now become an affair of great expense in the populous parts of the country; and, that it might, with great advantage and perfect ease, be got rid of, I shall clearly show in another part of my work.''

''From December to May there is not a speck of green. No green grass and turnips, and wheat, and rye, and rape, as in England. The frost comes and sweeps all vegetation and verdant existence from the face of the earth. The wheat and the rye live; but they lose all their verdure.''

[New York.] ''May 16, 1817. Dry wind, warm in the sun. Cherry trees begin to come out in bloom. The Oaks show

no green yet. The Sassafras in flower, or, whatever else it is called. It resembles the Elder flower a good deal."

"Let us, now, take a survey, or rather a glance at the face which nature now wears. The pears, apples, and other fruit trees have not made much progress in the swelling or bursting of their buds. The buds of the Willow tree have bursted (for in spite of that conceited ass, Mr. James Perry, to burst is a regular verb and vulgar pedants only, made it irregular) and those of a lilac, in a warm place, are almost bursted, which is a great deal better than to say, 'almost burst.' Oh, the coxcomb! As if an absolute pedagogue like him could injure me by his criticisms! And, as if an error like this, even if it had been one, could have anything to do with my capacity for developing principles, and for simplifying things, which in their nature are of great complexity! The Oaks, which in England have now their sap in full flow, are here quite unmoved as yet. In the gardens in general there is nothing green, while in England they have Broccoli to eat, early cabbages planted out, coleworts to eat, peas four or five inches high. Yet, we have green peas and leaved cabbages as soon as they will."

"Transplanting Indian Corn.

"I was always of opinion that this would be the best mode, under certain circumstances, of dealing with this crop. The spring, in this part of America, and further to the north, is but short. It is nearly winter till it is summer. The labors of the year are, at this season, very much crowded. To plant the grains of the Indian Corn over a whole field requires previous plowing, harrowing, marking, and manuring. The consequence is, that, as soon as there are so many other things to do, something is but too often badly done. Now this could be postponed by transplanting the plants of Indian Corn. I was resolved to try this; and so confident was I that it would succeed that I made some part of my preparations for six acres."

[Evansville, Indiana.] "June 23, 1818. See great quantities of turkey buzzards and thousands of pigeons. Came to Pigeon Creek about two hundred and thirty miles below the

falls, and stopped for tonight at Evansville, a town of nine months old near the mouth of it."

[Lexington, Kentucky.] "July 10, 1818. Leave Frankfort, and come through a district of fine land, very well watered, to Lexington. Had the good fortune to meet Mr. Henry Clay, who carried us to his house, about a mile in the country. It is a beautiful residence, situated near the center of a very fine farm, which is just cleared and is coming to excellent cultivation. I approve of Mr. Clay's method very much, especially in laying down pasture. He clears away all the brush or under wood, leaving timber enough to afford a sufficiency of shade for the grass, which does not thrive here exposed to the sun as in England and other such climates."

Enough has been quoted to show that while William Cobbett's main concern was not with America but with William Cobbett, his journal nevertheless makes interesting reading. As Hazlitt says of him in one of his "Table Talks," "He does not talk of himself for lack of something to write about, but because some circumstance that has happened to himself is the best possible illustration of the subject, and he is not the man to shrink from giving the best possible illustration of the subject for a squeamish delicacy. We feel delighted, rub our hands and draw our chairs to the fire, when we come to a passage of this sort; we know it will be something new and good, manly and simple, not the same insipid story of self over again."

INFORMATION FURNISHED BY THE GARDEN

The Missouri Botanical Garden has long been recognized as a source of botanical and horticultural information, not only by the citizens of St. Louis but throughout the country. In order that readers of the BULLETIN may have a more definite idea of the kind of questions to which answers may be obtained it has been decided to publish from time to time a list of the inquiries received, by personal visit, by telephone, and by mail.

INQUIRIES RECEIVED DURING APRIL

St. Louis:
- Kind of grass to use and treatment of lawns..... 12
- Kind of shrubs and trees to plant, where to obtain them and care of same..... 7
- Where to obtain and how to plant water-lilies..... 3
- Propagation, care, and varieties to use, of roses, iris, and other bedding plants; also house plants; where to obtain; planning of backyard gardens..... 13
- Causes of specific plant diseases and remedies for same, either fungous or insect..... 4
- Information on soil and fertilizers..... 2
- Various requests for information from books contained in library 7
- Library consulted by students from Washington University, St. Louis University, and scientific staff of commercial concerns.
- Request for loans of cuts from BULLETIN..... 1
- Information about power mowers.
- How to treat a tree burned by fire.
- How to treat tulips after flowering.
- Properties of a plant supposed to be medicinal.
- Concerning Paraguay tea.
- Use of seaweed.
- Raising fish and plants for aquaria.
- Pollens concerned in hay-fever.
- Regarding use of colloidal sulphur.

Alabama:
- Information concerning Henry Shaw and founding of Garden.

Arkansas:
- Concerning hardy water-lilies.....2
- Best plants for home grounds.

Colorado:
- Concerning *Victoria regia.*

Georgia:
- Method of propagating azaleas and camellias.

Illinois:
- Hardiness of certain plants in that state.
- Identification of shrub.
- Value of sawdust as fertilizer.
- Identification of plant.
- Best varieties of shrubs, and care.

Iowa:
- Concerning old horticultural varieties of garden vegetables described in unique collection of old seed catalogues in Garden library.

Kansas:
- Botanical material for classes.

Kentucky:
Information on soil fertilizers.
Massachusetts:
How to obtain seed from Russia.
Information concerning chrysanthemums and orchids.
Michigan:
Information on prairie wild-flower seed.
Information on herbarium specimens.
Minnesota:
Verification of quotation from Ovidius Motalbanus "Hortus Botanographicus," 1660.
Missouri (outside St. Louis):
Where to obtain water-lilies.
Concerning possibility of transmitting disease by planting seed from foreign country.
Use of copperas to destroy dandelions.
School for Gardening—2 requests.
Use of bent grass.
Effect of electric light on plant growth.
Identification of plant.
Request for economic plants.
New York:
Information concerning the Garden.
Request for use of cuts from BULLETIN, and permission to reprint article.
Ohio:
Information concerning the Garden.
Identification of twigs.
South Carolina:
Information concerning shading of greenhouses.
Tennessee:
Rose planting.
When to plant tropical water-lilies.
Where to obtain *Ornithogalum arabicum*.
Texas:
Identification of native Texas plants and of cultivated plant.
Customers for cacti.
Washington:
Concerning title-page and preface to Matthiolus' "Herbal."
Information regarding BULLETIN.
West Virginia:
Material for the study of forestry.
Wisconsin:
Information concerning cacti, where to obtain, kind of soil, etc.
District of Columbia—Washington:
Identification of Costa Rican plants.
Loan of herbarium material.
England:
Where to obtain plants for specific purposes.

NOTES

The March, 1926, number of the "New Phytologist" contains an article by Dr. B. M. Duggar, Physiologist to the Garden, on "The International Congress of Plant Sciences."

Dr. George T. Moore, Director of the Garden, spoke before the annual joint meeting of Phi Beta Kappa and Sigma Xi, at Washington University, May 4, "On Being Scientific."

The Nature Study Group of the National Girl Scouts visited the Garden, April 20, and were conducted through the buildings and grounds by Dr. Edgar Anderson, in charge of School for Gardening.

The annual flower sermon, provided for in the will of Henry Shaw, was preached at Christ Church Cathedral, on Sunday, May 11, by the Rev. Joseph Fort Newton, Rector of St. Paul's Church, Overbrook, Philadelphia, Pa.

Dr. Edgar Anderson, Geneticist to the Garden, Mr. Clarence Kobuski, Rufus J. Lackland Research Fellow, Mrs. Elva Pumphrey Miller, Research Assistant, and Dr. Roland La Garde, Scientific Assistant, were initiated into Sigma Xi, on May 4.

Dr. George T. Moore attended the annual meeting of the American Philosophical Society in Philadelphia, April 22-24, and on April 22 gave a paper before the body on "An Accurate Identification of Wind-Borne Pollens for Diagnostic Tests in Hay-Fever.

Mr. G. H. Pring, Horticulturist to the Garden, attended the second National Orchid Exhibition given by the American Orchid Society, at Philadelphia, May 7-9. The Society presented the Garden with a silver medal as a special award for an educational exhibit of orchid seedlings.

Dr. B. M. Duggar, Physiologist to the Garden, spoke before the National Academy of Sciences, April 27, on "The Colloidal Behavior of the Agency Inducing the Mosaic Disease of Plants"; and on May 13, broadcasted a talk from Washington, D. C., on "How Plants Behave When Diseased."

STATISTICAL INFORMATION FOR APRIL, 1926

GARDEN ATTENDANCE:

Total number of visitors	14,620

PLANT ACCESSIONS:

Total number of plants received as gifts	206
Total number of seed packets received in exchange	205

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	29
Total number of books and pamphlets donated	43

HERBARIUM ACCESSIONS:

By Gift—	
Teas Nursery Co., by Edward Teas—*Cornus florida* from Texas	1
Anderson, Dr. E.—Plants of Arkansas	14
Churchill, Hon. Joseph R., by Walter Deane—Plants of Vermont and Massachusetts	29
Cameron, E. T.—Plants of Missouri	2
By Purchase—	
Henderson, Professor L. F.—Plants of Oregon	187
By Exchange—	
Botanical Museum, University of Cluj, by Professor Al. Borza—Flora Romaniae exsiccata, Cent. VI, Nos. 501-600, inclusive	100
U. S. Department of Agriculture—Plants of Manchuria, China	7
Total	340

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

Vol. XIV JUNE, 1926 No. 6

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1926

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THE BLACK LOCUST
(Robinia Pseudo-Acacia)

Missouri Botanical Garden Bulletin

Vol. XIV JUNE, 1926 No. 6

THE BLACK OR COMMON LOCUST

(Robinia Pseudo-Acacia)

Of all the native American plants which have been grown commercially, probably none has had as checkered a career as the black locust. Like the King of France in the nursery rhyme it has scaled the heights of public favor only to retreat ignominiously. Originally native only to the central Allegheny Mountains and to the western edge of the Ozark plateau, its introduction into society may be said to date from 1601 when its seeds were sent to Jean Robin, herbalist to the King of France. When once released from its narrow mountain valleys, it spread so amazingly that in 250 years it was one of the commonest trees of Europe and of America and was strongly recommended on both sides of the Atlantic for forest planting. Here in America it had thriven particularly well and had spread from dooryards and gardens to run wild in roadside thickets and by mountain streams over practically the whole of eastern North America. From Ontario and Nova Scotia to the Gulf states it is to-day found wild as commonly as many native trees. On the hills along the Ohio River and in burned-over districts of the Pennsylvania mountains it occurs in practically pure stands. The famous "bluegrass" district of Kentucky might well be renamed the "locust" district, for there every farmhouse is set in a grove of locusts, and when flowering time is over their white petals lie in drifts along the roadsides. While there are no records of its having made itself so thoroughly at home in Europe, its beautiful white flowers with their sweet-pea fragrance and its durable wood have made it one of the most popular of all the trees introduced from the Americas.

In spite of its undoubtedly good qualities as an ornamental and a timber tree, its greatest day has passed and it is no longer recommended for planting in eastern North America. The cause of this loss of public favor was a beetle, the locust borer, *Cyllene Robiniae,* the grubs of which bore into the tree and honeycomb the wood from the main trunk to the smallest branches. Against the ravages of this borer, gardeners and foresters are practically powerless, and the only remedy has been the rather desperate one of planting other kinds of trees. Isolated specimens are more subject to attack than trees growing in woodlands, so that in many parts of the country locusts have practically disappeared as a lawn tree. The species is by no means exterminated, even in the most badly afflicted regions, but one can never tell when a tree may become infested.

The locust is a truly American tree. Not only is the species native to this country but the entire genus, embracing at least eight and perhaps as many as fifteen species, is confined to North and Central America. The genus Robinia (named after Jean and Vespasian Robin who introduced the locust into cultivation) is a member of the Leguminosae or pea family and is characterized by showy wisteria-like racemes of flowers and flat, several-seeded pods. The technical description of the black locust is as follows:

> Tree occasionally 80 feet in height, usually much shorter and suckering badly from the root so as to form thickets when undisturbed; bark brownish gray and so deeply furrowed as to appear woven; leaves odd-pinnate with 7 to 19 ovate leaflets, graceful and lacy in general effect; stipules in pairs, usually persisting as thorns; flowers white, in drooping racemes, fragrant; pods smooth, 4 to 8-seeded, remaining on the tree well into the winter.

The general shape of the tree is very graceful in young specimens but the branches break easily and old trees are always staggy and often unsightly. In flowering time, however, even the oldest and most decrepit specimens are so thickly hung with flowers as to obscure the leaves and veil the branches. There are a number of garden varieties and hybrids with other species of Robinia, though they are seldom seen outside of collections. One curious form has a single

large leaflet instead of the usual small ones. Yellow-flowered and pink-flowered varieties have been described and a pyramidal and a weeping form are sometimes seen.

Like many other members of the bean family, the black locust has the interesting habit of moving its leaflets in response to certain stimuli. It does not shrink them violently, as does its more famous relative, the sensitive plant, nor does it rotate them conspicuously like its other cousin the telegraph plant. Its action is of the sort usually referred to as a "sleep movement." At night, or during dark, cool weather, its leaflets will be found hanging limp from the mid-rib instead of standing out sideways. Seen by the aid of a strong flash-light, the difference from the day-time posture is very striking, although it is probable that few of those who own locust trees have ever noticed them "going to sleep." The phenomenon has, however, been commented upon and discussed by naturalists ever since the tree was first introduced into Europe. As long ago as 1640 Parkinson described "each leaf foulding itself double every evening upon Sunne setting and opening again upon the rising."

THE GREAT LOCUST BUBBLE

When we speak of plant manias, the story of the Dutch craze for tulips comes instantly to mind. Thanks to the charm of Dumas' facile pen, every schoolboy knows of the search for the black tulip. Other plants, lacking as skilled a romancer, have had their brief season of publicity, to pass into comparative oblivion when public fancy has turned elsewhere. One of these plants was the common American locust, *Robinia Pseudo-Acacia*, often seen about old farmhouses in Saint Louis County. The story of its popularity in England during the nineteenth century has already been alluded to in the November, 1925, and May, 1926, numbers of the BULLETIN, but it may well be told in its entirety.

The story may be said to start in the early years of the nineteenth century when William Cobbett, as enthusiastically intemperate in politics as in horticulture, spent several years in this country to escape political persecution. While on Long Island he was shown several old locust timbers which

had remained sound for half a century though they had been in contact with the earth. Greatly impressed with their durability, which exceeded that of English oak, he took care to introduce the tree on a large scale when he returned to England. Preliminary results showed that it grew rapidly there and he became convinced that in two generations it would be the chief timber tree of England, if not of Europe.

When Cobbett believed in anything, be it a political theory or an American plant, he never went half way, and the locust was no exception among his enthusiasms. Praise it he did in private and in public, publishing a book on woodland management, a large part of which is given over to a consideration of the rate of growth, qualities of timber, and ease of cultivation of the American locust. A copy of his book, "The Woodlands," is in the Garden library, and after the lapse of a century makes interesting reading. Cobbett himself prophesied that it would, although he expected us to be impressed instead of amused. He says (and the italics are his own): "This account will be read *hundreds of years hence.* The time will come (and it will not be very distant) when the *Locust-tree will be more common in England than the Oak;* when a man would be thought mad, if he used anything but *Locust* in the making of *sills, posts, gates, joists, feet for rick-stands, stocks, and axletrees for wheels, hop-poles, pales,* or for anything where there is *liability to rot.* This time will not be distant, seeing that the Locust grows so fast. The next race of children but one; that is to say, those who will be born *sixty* years hence, will think that Locust trees have *always been* the most numerous trees in England and some curious writer of a century or two hence will tell his readers that, *wonderful* as it may seem, 'the Locust was hardly known in England until about the year 1823, when the nation was introduced to a knowledge of it by William Cobbett.' What he will say of me besides I do not know; but I know that he will say this of me. I enter upon this account, therefore, knowing that I am writing for centuries and centuries to come."

He describes the durability of the timber and lest any one should doubt his word he resorts to the same system of testi-

monials which has more recently proved so useful to patent-medicine and other advertisers.

"*Plandome*, 23 *August*, 1819.

"I have this day given to William Cobbett a Locust post six feet long, and squaring three inches by three and a half, which is perfectly sound in all its parts, and which has stood in the ground, as part of a fence, in front of my house, from the year 1791 until about five weeks ago, when the fence was taken up.

"SINGLETON MITCHELL."

"*Bayside, Flushing*, 25 *Oct.* 1819.

"My brother, EFFINGHAM LAWRENCE, has this day taken up out of the ground, and given to WILLIAM COBBETT, a hog-gallows post; that is, a post having a fork at the top, for the purpose of lodging a pole on, and on which pole hogs are, when killed, hanged up by the heels. * * * * * * * When I first knew it, it was a very old post. I remember hearing my father say, that it was a *wonderfully old* post then. I should suppose it to have been a post upwards of *fourscore years*.

"HENRY LAWRENCE."

Like the yeast venders of the present day, he was anxious that the reader should understand that the writers of these testimonials were real people. "Will anyone suppose, that the names that I have made use of here, are not real names? Amongst the wretched calumniators of the day, there may be some to *pretend* to believe this; but no one will believe it. I wish, however, to leave no doubt with regard to a matter, which, as the reader will clearly see, I have long had my heart set upon. I will therefore state, that Mr. SINGLETON MITCHELL is a brother of the really celebrated DOCTOR MITCHELL, of New York, who has written so ably on natural history, who is famed for his learning," etc., etc.

Further statistics are introduced to show that the tree grows rapidly in England, "I have now taken the plantation of Mr. GUNTER, at EARL'S COURT, not *a mile from Kensington*. This plantation was made *FIFTEEN YEARS AGO*. It consists of *Locusts, Scotch Firs,* * * * *and Oaks*. I have, by permission of Mr. GUNTER, had the trees of this plantation *measured* with great exactness. * * * * The reader will be surprised to see the *vast superiority* of the growth of the Locust, over even the *softest* and *most fast-growing* of our English trees; but *there are the trees to be seen* by any gen-

tleman that will apply to Mr. GUNTER'S bailliff, who, I believe, planted the trees.''

With such advocacy it is not surprising that the tree was much talked of and written about and planted. A nursery was organized for the special propagation of locusts and they were planted by the hundreds of thousands. Lord Folkestone, Earl of Radnor, bought nearly 14,000 for his estate in Berkshire. Seventeen years after Cobbett's publication of ''The Woodlands'' interest was still so intense that one W. Withers of Norfolk was able to find a ready market for a book which was a mere compilation of articles on the growth, qualities, uses, and cultivation of the locust, or acacia, as he preferred to call it.

Thus the great locust boom was started by the active pen of William Cobbett, aided by a host of lesser scribblers. But though the pen is mightier than the sword, it is not mightier than the laws of nature, and after the original enthusiasm had died down the tree had to make its way on its own merits. One hardly needs to say that Cobbett's extravagant claims were never realized. Travelers in Great Britain still report the British oak as being commonly grown and used in those islands. When Elwes and Henry compiled their monumental work on British trees in 1912, they paid particular attention to the history of the locust plantation of the previous century. Elwes reports that the trees have been almost everywhere neglected. ''It has always,'' he says, ''been obnoxious to the British woodman, partly on account of its thorns which tore his clothes and hands, partly on account of the hardness of its wood which blunted his tools, and partly because of its liability to be broken by the wind, and to reproduce from suckers when cut.'' In only one of the many plantations they examined did they find a favorable report. Sir Hugh Beevor, of Hargham, Norfolk, reported that it made excellent and durable stakes for rabbit-proof fencing. ''To make stakes no tree is so well fitted, and it would be worth planting for this purpose only.''

The first century of William Cobbett's prophetic vision has passed and the tree which he predicted would change the course of British forestry and make him immortal is reported

as "good for making rabbit-proof fencing." What will another century show?

ST. LOUIS—1819.

The following reminiscences of Mr. Shaw were found among some old papers, and it is believed that they are worth reproducing both because of their historical interest and the light which they throw on Mr. Shaw's personality. They were written in Mr. Shaw's own hand in ink, accompanied by an outline in pencil, which apparently was later elaborated into the form herewith printed. Whether any more of these reminiscences were ever prepared it is impossible to say, but apparently the work was never completed. The spelling, punctuation, capitalization, etc., are reproduced exactly as written by Mr. Shaw.

"To satisfy the enquiries of several friends the following are Henry Shaw's reminiscences of St. Louis.

"Embarked at N Orleans March 14/19 on the Phil[a] built steamer Maid of Orleans Capt Turner & after a tedious passage arrived in St. Louis May 4th 1819. on the voyage up met many flat boats & a few barges from the Ohio loaded with ——— and a few steams — below Natchez — No settlements between Natchez and New Madrid — from want of steam press had to lay a warp at one of the Chicksaw Bluffs and at Cape Cinque-hommes — at the Nogales or Walnut Hils (Vicksburgh) ascended to the summit, covered with trees, no human habitation visible — same at ——— Chicksaw bluffs. dense forests here & there prostrated by tornadoes and invaded by the overflowing waters of the Mississippi — On the morning of our arrival, had only been enabled to reach port, by making free with the fence rails of Judge Bent for fuel, then residing on the river below the town. The price of passage from N Orleans was 120 Dollars, and the rate of freight $5.00 per 100 lbs. The number of passengers was fourteen, of which number I well remember the following. Miss L A Benoist, returning from France, Desloges from France, Joshua Bright, Joshua Pilcher, and Christophe Sanguinette, all of St. Louis, Mr. Ground from Engl[d], Mr. Thos. Anderson, N Orleans, and Sign[r] Artigo, Spanish Consul,

all of whom have long passed down the stream of time, Mr. Desloges being the last.

"The river shore, or Landing, opposite the town was not built on nearer than Main Street, a rocky bank bounded the landing with narrow openings leading to the Main Street, the residence and business street of the town, except at the open market square where the shore was left abrupt, and here Lafayette landed in Ap. 1825. Buildings on Front Street, called the Levee, began to be erected about 1830; stone warehouses of one story at first, and a little before and after the fire of 1849 of larger dimensions. The principal articles imported were flour and provisions from Louisville and Cincinnati; Iron, glass and hollow ware from Pittsburgh; dry goods from Philadelphia via Pittsburgh, a few Indian goods from Makinaw, and coffee, sugar and other groceries from New Orleans. The principal customers of St. Louis merchants were from Edwardsville, Cahokia, Kaskaskias, Sanguinon county, and other settlements in Illinois, S^{t} Charles, Boonslick county, the Lead mine districts, and other settlements in the Territory of Missouri. The peltries came down from the Indian country in June and July of each year, consisting principally of deer skins, bufaloe robes, Beaver, otter &c. prices paid for peltries much the same as at present, except beaver then in universal use for hats, was worth in general 4 to 5.00 or more, per lb. Boats from New Orleans up to 1828 made the voyage in 20 to 30 days; from Louisville in 6 to 8 days, increasing their speed in the latter years — freight from New Orleans 2.00 to 4.00 per 100 lbs. — goods most in demand were provisions, sugar and coffee, salt and wiskey, the production of flour and provisions at home annually increasing — trade was still on a limited scale in these times; for when a steam boat came in sight, creeping slowly round the sand bar that then surrounded the town, the draymen, mostly blacks, would assemble on the landing, where I heard a good natured darkey exclaim: dere comes de ole Plow Boy, wid a bar'l flour and a bag of feathers, an fifty ob us to carry em.

"Letters from the East came by mail in about 20 days, and from Europe seldom less than 60 to 90 days. The journey to

Philadelphia was sometimes made on horseback, and sometimes by boat to Pittsburgh, and thence by stage.

Population of St. Louis in		1819	was about		3700
D°	D°	1830	"	"	8000
D°	D°	1840	"	"	14,500

"The original settlers of the Post of St. Louis were principally French canadians and creoles of French and Canadian origin, several old persons still survived in 1819 who joined Liguest Laclede at St. Louis in 1765, from Cahokia, Post St. Vincent, and fort Chartres who came here to live under French colonial rule, rather than remain in Illinois under the English government.

"Louis the XV had in the meantime turned over his French possessions in America, west of the Mississippi, to his cousin of Spain Charles III when in 1768 Don Antonio De Ulva the Spanish Governor of Louisiana, sent an officer and a few troops to take possession of Upper Louisiana. St. Ange de Bellerive the worthy Canadian commandant of the French post, quickly resigned his authority to Piernas, and the little French village were glad to have the protection of the Spaniards against the hostile Indians, the Sacs and Foxes of the north, the Iroquois of the East, and the Chickasaws of the South, all enemies of the French, and of their perfideous allies the tribes of the Illinois. The Sacs and Foxes of the Upper Mississippi, who traded with the British at Makinaw, had been at war with the Illinois for many years, to avenge attrocious murders and had even attacked them in sight of the French garrison at Fort Chartres; but in 1780 the east side of the Mississippi being Anglo American territory, a small war party came down the river against the friends of their old enemies the Illinec, and of their more recent foes the Missouries. Crossing over from Portage des Scioux, and the Missouri River they came on the villagers, who were engaged in planting their spring crops at the Cul de Sac or Rock Spring and on the St. Charles road tomahawked some 14 men and boys, and returned in triumph to their villages on Rock River, with the captured scalps, but being few in number, the saveges came near but did not attack the village of St. Louis, which was surrounded by a picket fence as a

protection against Indian foes. At the transfer of the country to the United States, the inhabitants of St. Louis, were distant colonists, who spoke French, most of whom had no style of dress or manners peculiar to the people of France except in language. The habits of the people were orderly and moral, and a few families were of high social refinement. Mons. Zenon Trudeau a former Spanish commandant at St. Louis was their schoolmaster in 1819; their pastimes and amusements were smoking pipes, playing cards, drinking coffee, and dancing parties in winter. Many old fashioned people of both sexes wore Indian shoes or moccasins, and blue Burnagore handkerchiefs on their heads, only the young people spoke English. Mr. Elihu R. Shepard kept the first English school of any note, a number of young men of the old families were sent to Kentucky to school. The Jesuits College (St. Louis University) commenced about 1825 by a Belgian Father Van Quickenbourne purchasing a block of ground on Washington Avenue of Majr Willm Christy. In Spanish times Mr. Pierre Chouteau Senr and Motard surveyed land grants, when so requested by the commandant. they surveyed and laid off the concessions of the Barriere a Denoyer fields, now Tower Grove in 1788. Mr. Soulard Senr was the land surveyor of the colony subsequently.

"Slavery or Negro servitude, was more useful in the settlement of Lower Louisiana, than of Illinois and Missouri. The clearing of the forests on the river about New Orleans, only commenced in 1720 when negroes were imported from the coast of Africa, and the West Indies to do the work. The first French settlers from Canada and Europe were ill adapted to the heavy work of clearing forests in a semitropical climate; so that from the time that Ibberville and Bienville commenced in 1699 to colonise Louisiana, up to 1719 it remained an impenetrable desert, subject to yearly inundation; the colonists few in number living on provisions sent from France, and corn from St Domingo. Under these circumstances the Negro was a blessing to that miserable God-forsaken country; in 1819, a century had elapsed, and the shores of the Mississippi protected by levees, were beautiful, and probably the most fertile and finest cultivated country on the Continent of America.

"The village of St. Louis took its supply of water principally from the river, as most wholesome and convenient; it was hauled up from the Mississippi on sleds drawn by ponies, a barrel at a time, and settled in large earthen jars, each family being provided with them; the cost of a barrel was generally a picallou, (picayune 6¼¢) or an escalin (bit 12½¢). Chouteaus pond formed by Rock spring (La petite Riviere), extended from 7th Street, almost to Jefferson Avenue bridge, but quite narrow in some places; the mill stood a little west of the brick offices of the Union Depot on 7th Street. The venerable village miller Mr. Gabriel Chouteau is still living (1880) on 6th Street near Poplar, at the advanced age of 87.

"After the Indian attack of 1780, small round towers, of course rubble stone were erected on the hill about 4th and 5th Street by the Spanish troops, also an angular fort with bastions near the intersection of 3rd and Green Streets; these were demolished in 1825, and used as material to macadamise Main street which before that was at times almost impassable. The sand bar in front of the town began to wash away about 1830, and in 7 or 8 years had nearly disappeared, to this and the effective sewerage may be attributed the improved health of the city; but the clearing and settlement, of Missouri and Illinois, cannot in any sensible degree have affected the climate, for being prairie countries, the growth of timber has not diminished in many parts. The earliest great flood that occurred at St. Louis was in 179— when as Mons. Brazeau Sen^{r} told me the bottom lands opposite St. Louis were like a sea as far as the bluffs; Cahokia entirely submerged, and the low grounds in the south part of the city also suffered. The same occurred again in 1846, probably in rather less degree, these extreme high waters only happen, in seasons of excessive rains, when the tributaries of the Missouri and Mississippi concur in rising simultaneously.

"The old French residents designated St. Louis Le village, and New Orleans La ville, corresponding to village and town. The two largest houses of the old town were those of the two elder Chouteaus, Auguste and Pierre, built of stone with wide galleries on three sides, and gardens enclosed by stone walls. The first brick was Gov^{r} W^{m} Clarks, when he had his office of government superintendent of Indian Affairs.

Mr. James Kennerly had a good brick building on Main near Olive Street, occupied by Capt. Theodore U. S. Recorder of Lands. Manuel Lisa and Mr. Pratt Senr had brick houses on the block between Chestnut and Market streets, the former occupied by Peter and Jesse G. Lindell; also Mons. Antoine Cheniè on the west side of the street.

"May 1780. Fete Dieu — Witsunday, towards evening some ladies taking a cart (the vehicle of those days) accompanied by their coloured servants, went out strawberrying on the prairie, a short distance from the village; one of whom Mrs. Labadie (whom the writer knew in after life) strayed a short distance from her companions, and saw, or thought she saw, among the bushes in one of those depressions called a sink hole, the partly concealed form of an Indian warrior The alarmed party returned home with all speed. Madam Labadie related what she had seen to some of the leading men, Mons. Cadet Chouteau, Charles Gratiot, Sanguinette, and others, who went to search for the Indian, but could find none, and so deemed it an illusion. The attack was made on the following day, after the fete Dieu, rather than the day of the holiday when the inhabitants would be assembled for the celebration.

"A man by the name of Cardinal, who lived at a spring near the present Cass and Grand avenues, mysteriously disappeared in this affair and was never heard of, or his body found. The Indians engaged in the attack, to whom he was known, affirmed afterwards that they did not slay him, or ever saw him. Cardinal avenue perpetuated his memory.

"Two years after the attack, the Sack chiefs being in council at St. Louis, one of them seeing Mrs. Labadie came to her and taking her by the hand, sister, says he I saw you in the prairie and am glad I did not kill you. A circumstance that has excited some attention, is that Francis Zavier Martin in his excellent "history of Louisiana" vol. 2 Chap III published in 1829, states that "In the fall (of 1780) the British commanding officer at Michilimakinac, with about 140 men from his garrison, and near 1400 Indians attacked the Spanish post of St. Louis, but Col[l] Clark who was still at Kaskaskia came to their relief." Martin's history of Louisiana is probably the best history of Louisiana extant, but here he has evi-

dently made a mistake. The attack on the post of St. Louis was made in the spring, and by a war party of Indians only. Mr. Gabriel C. Chouteau whose father was present at St. Louis at the time never heard any one say, that the post of St. Louis received assistance or protection from Col[l] Rogers Clark, and his troop from Kentucky, as they were at that time on their way from Post St. Vincent or Vincennes to capture the British post of Kaskaskia, and that when arrived there, as he has heard his Uncle Gabriel Cerré say, that they were in rather poor plight, and distressed for clothing, and took his uncle's Indian strouds and blankets for apparel for which he got promises of payment that were never fulfilled. In another more pretentious History of Louisiana published in 1850 by Ch[s] Gayurré in grandiloquous style, no mention whatever is made of the attack on the post of St. Louis. Judge Martin continues, "The Indians who came from Michilimakinac, having no idea of fighting any but Spaniards, refused to act against Americans, and complained of having been deceived. Clark released about 50 prisoners that he had made, and the enemy made the best of their way home" which is probably correct; Martin notes his information drawn from public documents, gazettes &c. More important events at that time were taking place, in the victories of the Spanish troops under the renowned Don Bernardo de Galvez over the English in Louisiana and Florida, so that the Indian attack on the far distant post of St. Louis, got to be mistated by Martin, and overlooked by Gayurré.

"On the transfer of Louisiana to Spain Don Alex[r] O Reilly an Irishman, was appointed Governor and Captain general of the Province of Louisiana, arrived in 1769, with a large military force, and took quiet possession, among the first acts of his administration was to send instructions to the different posts depending on Louisiana; the population of St. Louis at that time consisted of 891 individuals, and St. Genevieve about the same number, freemen and slaves, and Captain Don Pedro de Piernas was the first Spanish commandant at St. Louis. A many of O Reillys regulations were considered to be an improvement, on those of the previous French governors, one was that the commandants of St. Louis and St. Genevieve shall take care that the Indians be well treated, and be paid

an equitable price for the skins they may bring to market. O Reilly by a special proclamation declared that the practice of reducing Indians to slavery was contrary to the wise and pious laws of Spain. On his arrival a number of Frenchmen were ousted, thrown into prison, and of the number six were shot for rebellion.''

INQUIRIES RECEIVED DURING MAY

St. Louis:
- Kind of grass and treatment of lawns..... 10
- Kind of trees and shrubs to plant, where to obtain and how to grow them..... 14
- Where to obtain and how to plant water-lilies..... 2
- Causes of plant diseases, and remedies..... 5
- How to get rid of ants and other pests..... 6
- Information on soil and fertilizers..... 3
- Identification of plants, etc..... 8
- How to stop woodpeckers from boring holes..... 1
- Treatment of tree torn by truck..... 1
- Care of bulbs..... 3
- Information about School for Gardening..... 3
- How to kill undesirable tree..... 1
- Eradication of weeds..... 2
- Advice on tree surgery..... 2
- Various requests for information from books in library..... 11
- Library consulted by students and staff from Washington University, St. Louis University, City schools.
- Requests for certain BULLETINS..... 4

Alabama:
- Concerning creeping bent grass.

Arizona:
- Publishers, etc., of certain books on orchids.

California:
- Request for publications.
- How to grow mushrooms.

Colorado:
- Request for publications.

Connecticut:
- Request for publications.

Florida:
- Identification of plant.
- Request for certain BULLETIN.

Illinois:
- Information about School for Gardening.
- Request for seeds.
- Care of certain plants.
- Where to obtain and culture of certain plants.

Indiana:
  Identification of hay-fever pollens.
Kansas:
  Request for BULLETIN.
Michigan:
  Hay-fever pollen information.
Minnesota:
  Loan of books.
  Information concerning plant labels.
Missouri (outside St. Louis):
  Planning iris garden.
  Where to obtain lily plant.
  Identification of plant.
Nevada:
  How to grow orchids and where to procure them.
New Jersey:
  Requests for publications.
  Request for agaves.
New York:
  Cultivation of ramie in the United States.
  Regarding wild yeasts.
  Formula for pollen stain.
North Carolina:
  Where to obtain cacti and information concerning them.
Ohio:
  Request for BULLETIN.
  Where to obtain publications of Luther Burbank.
  Information on Plant Quarantine 37.
  Formula for pollen stain.
Oklahoma:
  Information on lawn grass.
Pennsylvania:
  Where to obtain Owen dust filter.
  Request for report on pollen work.
Virginia:
  Loan of books.
Washington:
  Loan of books.
District of Columbia—Washington:
  Loan of books.
Dominion of Canada:
  Loan of books.
  Information on hardiness of certain plants.
  Request for certain desert plants.
China:
  Request for certain publications.
Germany:
  Request for publications.
Hungary:
  Consultation of library.

NOTES

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Men's Club of the First German Presbyterian Church, May 11, on "Collecting Orchids in South America."

Dr. B. M. Duggar, Physiologist to the Garden, has been elected a member and chairman pro-tem of the Board of Trustees of the Bermuda Biological Station.

Dr. Duggar will spend the months of July and August at Cornell University, Ithaca, New York, in connection with preparations for the International Congress of Plant Sciences.

Number 2 of Volume XIII of the Annals of the Missouri Botanical Garden has recently been issued with contents as follows:

"Further Studies on the Subterranean Algal Flora of the Missouri Botanical Garden." George T. Moore and Nellie Carter.

"Pseudo-Fertility in Nicotiana." Fanny Fern Smith.

In recognition of "distinguished service rendered Iowa State College during a period of more than a quarter of a century," a twenty-five year service certificate was awarded Prof. A. T. Erwin, Chief in Truck Crops Section. Professor Erwin is an alumnus of the School for Gardening of the Missouri Botanical Garden.

Recent visitors to the Garden include Dr. Robert Ballenegger, Head of the College of Horticulture, Budapest, Hungary, now assigned to the department of soils, Michigan Agricultural College, under the exchange professorship inaugurated through the American-Hungarian Foundation; and Dr. Mitsuhari Ishikawa, professor of botany of the First College, Hongo, Tokyo, Japan.

At the commencement of Washington University, June 8, the degree of doctor of philosophy was conferred on Fanny Fern Smith and Emery R. Ranker, Rufus J. Lackland Fellows in the Henry Shaw School of Botany of Washington University; and the degree of master of science was conferred on Esther L. Larsen and J. Paul Reeves, Teaching Fellows in the Henry Shaw School of Botany.

STATISTICAL INFORMATION FOR MAY, 1926

GARDEN ATTENDANCE:

Total number of visitors	33,988

PLANT ACCESSIONS:

Total number of plants received as gifts	218
Total number of seed packets received as gifts	178

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	112
Total number of books and pamphlets donated	36

HERBARIUM ACCESSIONS:

By Gift—	
Braun, Dr. E. Lucy—*Ranunculus* sp., from Ohio	2
Deam, Charles C.—*Phacelia Covillei* Watson, from Indiana	1
Florists Publishing Co.—*Aralia spinosa* L. and *Ligustrum ovalifolium*, from Pennsylvania and Arkansas respectively	2
Smith, Miss Fanny Fern—*Phacelia* sp., from Oklahoma	3
By Exchange—	
Iowa Agricultural College, by Prof. L. H. Pammel—Plants of Wisconsin, Iowa, and Minnesota	245
U. S. Department of Agriculture, by Prof. A. S. Hitchcock—*Bromus unilioides* HBK., from Florida	1
U. S. National Herbarium, by Paul C. Standley—Plants of Costa Rica	19
By Purchase—	
Elmer, A. D. E.—Plants of Borneo	1,511
Total	1,784

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset, from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

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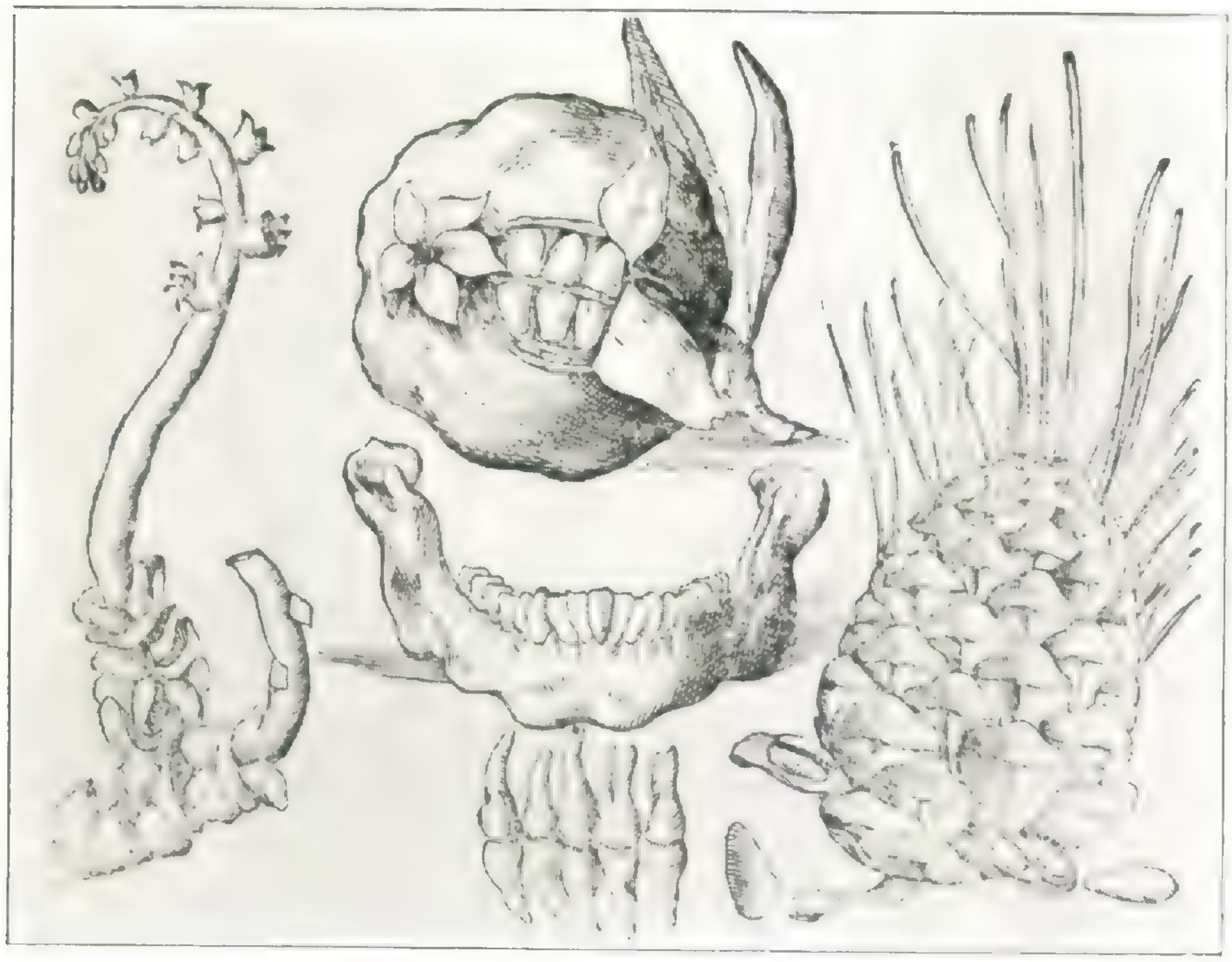

Reproduction of plate from Porta's "Phytognomica," showing toothwort, pomegranate, and pine cone, with a set of teeth.

Reproduction of plate from Porta's "Phytognomica," showing orchids, papillonaceous plants, butterflies, etc.

Missouri Botanical Garden Bulletin

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THE DOCTRINE OF SIGNATURES

"Step right up, gentlemen," harangues the quack at the country fair, "just read what it says on the label!" So, in substance, did William Cole address his audience of nearly three centuries ago in his "Adam in Eden," published at "the Angell in Cornhill," London, 1657. "Though Sin and Sathan have plunged mankinde into an Ocean of Infirmities Yet the mercy of God which is over all his Workes Maketh Grasse to grow upon the mountains and Herbes for the use of Men and hath not onely stemped upon them (as upon every man) a distinct forme, but also given them particular signatures, whereby a Man may read even in legible Characters the Use of them."

But to begin at the inauguration of this strange doctrine of divine labeling by "Signatures," we should go back a little over a hundred years to Philippus Areolus Theophrastus Bombastus von Hohenheim, the King of Quacks, whom Robert Browning has immortalized in his famous poem entitled "Paracelsus," the professional name of that gentleman. Born in 1493 in Schwyz, canton of William Tell fame, he early manifested a natural bent towards the Science, or rather Pseudo-science, of his period. He studied at the University of Basel, and was taught alchemy by the renowned Trithemius. He also acquired a practical knowledge of minerals in the mines of his native Switzerland. In 1526, after extensive travels over Europe, he returned to Basel, and became town physician and lecturer before the University. There, however, his eccentricity and boundless conceit caused him to give great offense by lecturing in the vulgar tongue, burning the writings of Galen, Avicenna, and other classics,

and interpreting his own works in their stead. In 1528 he resumed his wanderings, dying in Salzburg in 1541. Some say that he drank himself to death; others that he was murdered.

Because of the man's insurmountable egotism, one is hardly able to regard him as more than a contemptible charlatan.His very *nom de plume* is a standard of his vanity, since he coined it to indicate his superiority to Celsus, the Roman medical author of the first century. In one of his early works he lightly predicts, "I shall be the Monarch; and mine shall be the Monarchy!" In Browning's poem he is in the habit of telling people confidently that they shall some day be proud to have looked upon him. However, his value to the Science of that period was considerable, since he did much to stimulate the activities of Botanists, Chemists, and Physicians. To estimate what may be called his philosophic worth, one must explain his words as symbols. Thus, when he says that "Sulphur," "Salt," and "Mercury" make up all matter, we must read into his statement that he means combustion, growth, and change by "Sulphur"; non-inflammability and stability by "Salt"; and fluidity by "Mercury," according to Mrs. Arber, in her work on "Herbals." Later, when he states that the three elements are bound together with "azoth," a mysterious force, some might regard him as having anticipated the discovery of electricity.

But what chiefly concerns us here is a passage from his "Ettliche Tractatus des hocherfarnen und berümbtesten Philippi Theophrasti Paracelsi" (Strassburg, 1570): "I have often declared how we may know by the outward shapes and qualities of things their inward virtues, which God has put in them for the good of man. So, in St. Johnswort, we may notice the shape of the leaves and flowers, the porosity of the leaves, and the veins. The porosity or the holes in the leaves show us that this herb helps both interior and exterior holes or cuts in the skin. . . . The flowers of St. Johnswort, too, when they are putrified, are like blood; which teaches us that this herb is good for wounds, to close and fill them up."

That is Paracelsus' enunciation of what has been known as "The Doctrine of Signatures," of which many believe him to be the originator. But in spite of what is written in most

books concerning him, the idea was not original. Pliny, centuries before, hinted broadly to his readers that if they would but carry the plant known as "Dracontium" upon their person, serpents would not bother them, a sure predecessor of Cole's caution to put the plant called "hounds-tongue" in shoes, in order to "tye the tongues of Hounds so they shall not Barke at you."

Most authorities, however, assign to Giambattista Porta, a Neapolitan physician, the part of having first established the Doctrine of Signatures upon a scientific basis. Porta was a philosopher and observer of no mean worth, and wrote a suggestive treatise on interpreting human character by the study of physiognomy. This led to the publishing of his most famous work, "Phytognomica," Naples, 1588. It is probably this which Cole had in mind when he declared that plants have telltale signs of their traits as has every man. Porta assigns to the outstanding character of every plant the power of an analogous effect upon man. If a plant is long-lived, as *Sempervivum,* a brew from it will prolong life. A plant with a smooth surface will produce smooth skin, and conversely, a rough plant will roughen the skin. Thus, the hard, stony seeds of the Gromwell are good for gravel, and the yellow juice of the Turmeric is a specific for Jaundice.

He also declared that the labels upon plants are at times even more plain, bearing a resemblance to a part of the body to be healed or even to a mechanical cause of disease. In this development of Signatures, Porta shows ingenuity, for he gives very good illustrations of plants, and in the same plates includes drawings of the member to be healed, or the animal or insect whose bite or sting could be cured by it. For example, an illustration of a hand accompanies that of some plants having a root divided into five parts; a set of human teeth is printed with a picture of Toothwort, an opened Pomegranate, and a Pine cone; various winged insects are depicted below representations of Orchids and Papilonaceous flowers (pl. 32). Porta also holds that astrologers can tell the planet under which certain plants should be gathered by the reading of Signatures. He illustrates these plants in the same fashion as the medical herbs, by including

a representation of the heavenly body, as the moon, with the picture of the plant.

We now return to a consideration of William Coles, who was the last exponent of Signatures, as well as the most noted. Cole wrote two books, "The Art of Simpling" (1656), and "Adam in Eden" (1657) which is the more remarkable of the two and which has already been quoted. By this late date, the physicians on the Continent were almost unanimous in refuting the Doctrine of Signatures; some of them, like Dodonaeus, publishing elaborate criticisms of it (1583). Cole, however, in conservative England, kept his fidelity to the ancient models, and produced a work which, though it err, has still a lesson to teach.

The first part of "Adam in Eden" contains a conventional treatment of Signatures in the manner of Porta. For instance, his first consideration is the head, and the plants good for it. "*Wall-nuts*," he declares, "have the perfect Signature of the Head. The outer Husk or Green Covering representing the *peri-cranium* or the outward skin of the Skull, whereon the hair groweth, and therefore Salt made of those Husks or barks are exceedingly good for wounds in the Head. The Inner wooddy shell hath the Signature of the Skull, and the little yellow Skin or Peel, that covereth the Kernell, of the hard *Meninga* & *Pia mater*, which are the thin searfes that envelope the brain. The *Kernell* hath the very figure of the Brain, and therefore it is very profitable for the Brain and resists poysons: For if the Kernell be bruised, and moystned with the Quintessence of Wine and laid upon the Crown of the Head, it comforts the brain and head mightily." He further finds a significance for the worms of the green husk, which we, however, like all other writers upon Cole, forbear to quote.

One of Cole's claims to originality lies in his inclusion of a whole chapter upon herbs for "Bruit Beastes." In it we learn that wild goats wounded by arrows will heal themselves by eating dittany; that a toad bitten by a spider will use plantain leaves for a balm; that the goldfinch uses eyebright for sore eyes; that garlic will put spirit into fighting cocks; that when two oxen fight, loosestrife thrown between them will make them part. Several herbs are also said to

be opiates for animals, among which is hemlock. We read that "if Asses chance to feed much upon Hemlock, they will fall fast asleepe that they will seeme to be dead, in so much that some thinking them dead indeed have flayed off their skins, yet after the Hemlock had done operating they have stirred and awakened out of their sleep, to the griefe and amazement of the owners."

Unlike Paracelsus and Porta, Cole, who seems to have been an honest man, deemed it necessary to consider those plants which have no evident Signatures. In so doing, he attained true wisdom where his more pretentious rivals scorned it; and such quotations as the following, selected from both of his books, will bear careful consideration even in our own sophisticated day. "We must cast ourselves with great Courage and Industry (as some before us have done) upon attempting the Virtues of them which are yet undiscovered. For man was not brought into the world to live like an idle Loyterer or Truant, but to exercise his mind in those things, which are therefore in some measure obscure and intricate yet not so much as otherwise they would have been, it being easier to adde than invent at first. . . . They would not be without their use if they were good for nothing else but to exercise the Industry of Man to weed them out who, had he nothing to struggle with, the fire of his spirit would be halfe extinguished in the flesh."

Evidently taken with the notion of plants thus giving indirect benefit to mankinde, he continues in the following: "If gentlemen which have little else to doe would be ruled by me, I would advise them to spend their time in their gardens, either in digging, setting, weeding or the like, then which there is no better way in the world to preserve health. If a man want an appetite to his Victuals the Smell of the Earth new turned up by digging with a spade will procure it, and if he be inclined to a Consumption it will recover him." He refers to the Emperor Diocletian, who, according to him, "left for a season the whole Government of the Empire and forsaking the Court betook him to a meane House with a Garden adjoyning, wherein, with his own handes, he both sowed and set and weeded the Herbes of his

Garden which kind of life so pleased him, that he was hardly intreated to resume the government of the Empire. . . . Gentlewomen if the ground be not too wet may doe themselves much good by kneeling upon a Cushion and weeding. And thus both sexes might divert themselves from Idlenesse and evill company, which oftentimes prove the ruine of many ingenious people.''

With such sound counsel coming, as it were, from the apocalypse of the old Herbals, we may be inclined to ask ourselves if William Cole deserved to share the fate of Paracelsus and Porta. But today comparatively few people remember the old Doctrine of Signatures, and only such books or popular plant names as survive testify to the once broad acceptance which it enjoyed.

THE POWELL ORCHID COLLECTION

The acquisition by the Missouri Botanical Garden of this well-known collection of orchids, through the generosity of Mr. C. W. Powell, has not only added very materially to the number of botanical species belonging to the Garden, but has also made it possible to attempt numerous experiments with orchids which can only be carried on in the tropics. For, with the co-operation of the Canal Zone Government, plans are being made to continue ''Powell's Orchid Garden'' in the vicinity of Balboa as a southern branch of the Missouri Botanical Garden, and it is hoped that, because of the facilities that will there be available, the Garden may make very definite contributions to orchidology as well as to horticulture in general.

In the BULLETIN for November, 1923, under the title ''The Private Orchid Collection of Mr. C. W. Powell,'' is given a full account of this garden as it was at that time, so there is no need of further description. It is desirable, however, that the list of orchids added to the Garden collection be published for the benefit of orchid growers throughout the world, and while it is not apt to be of interest to the general reader, it may, even to them, serve as an indication of what an

addition has been made to the orchids of the Garden through Mr. Powell's gift.

ACINETA Ldl.

A. chrysantha Ldl. No. 314. Panama, Chiriqui Prov. 4000-5000 ft.
A. scita var. *turcica* Rchb. f. *. Panama.
A. superba Rchb. f. Panama.

ASPASIA Ldl.

A. epidendroides Ldl. No. 171. Panama, Chiriqui Prov.; Veraguas Prov. S. L.†
A. principissa Rchb. f. Panama.
A. Rousseauae Schltr. No. 39. Panama, hills near city. S. L.

BLETIA Ruiz & Pav.

B. florida R. Br. Panama.
B. purpurea (Lam.) DC. No. 45. Panama, hills east of city, S. L.; Chiriqui Prov. 4000 ft.
B. purpurea var *Pittieri* Schltr. No. 128. Panama, hills east of city. S. L.

BRASSAVOLA R. Br.

B. lineata Hook. No. 102. Panama, Chiriqui Prov. 4000 ft.
B. nodosa Ldl. No. 25. Panama, along both coasts. S. L.

BRASSIA R. Br.

B. Gireoudiana Rchb. f. & Warsc. No. 143. Panama, Rio Caldera. 3500 ft.
B. lanceana Ldl. Panama.
B. longissima Schltr. No. 87. Panama, near city. S. L.
B. longissima var *minor* Schltr. No. 72. Panama, near city. S. L.

BULBOPHYLLUM Thou.

B. pachyrachis Griesb. No. 364. Panama, Frijoles. S. L.
B. vinosum Schltr. No. 269. Panama, hills east of city. S. L.
B Wagneri Schltr. Panama, Chiriqui Prov., near San Felix, 3000 ft.

CAMARIDIUM Ldl.

C. affine Schltr. No. 7. Panama, hills near city. S. L.
C. arachnites Schltr. No. 210. Panama, Chiriqui Prov. 4000 ft.
C. grandiflorum Ames. Panama, Chiriqui Prov. 6000 ft.
C. latifolium Schltr. No. 8. Panama, hills near city. S. L.

CAMPYLOCENTRUM Benth.

C. peniculis Schltr. No. 184. Panama, hills near city. S. L.

CATASETUM L. C. Rich.

C. bicolor Kl. No. 168. Panama, Chiriqui Prov. 3500 ft.
C. macrocarpum Rchb. f. Panama.

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*Where no number is given, the species has not yet been rediscovered.

†S. L.=sea-level.

C. Oerstedii Rchb. f. No. 351. Panama, Chiriqui Prov, near Dolega. 1000 ft.
C. viridi-flavum Hook. No. 313. Panama, quite general. S. L.
C. Warscewiczii Ldl. No. 60. Panama, Gatun Lake, hills near city. S. L.

CATTLEYA Ldl.
C. Deckeri Kl. No. 81. Panama, hills east of city; Veraguas Prov. S. L.

CHYSIS Ldl.
C. aura Ldl. No. 309. Panama, near Arraijan. S. L.

CHONDRORHYNCHA Ldl.
C. Lipscombiae Rolfe. No. 47 & var. 11. Panama, Gatun Lake, hills near city. S. L.
C. Lipscombiae var. *caloglossa* Schltr. No. 11. Panama, hills near city. S. L.

CLEISTES Juss.
C. rosea Ldl. No. 113. Panama, hills east of city, near Tecumen. S. L.

COCHLIODA Ldl.
C. Warscewiczii Rchb. f. Panama.

COELIOPSIS Rchb. f.
C. hyacinthosma Rchb. f. Panama, Chiriqui Prov. 4000 ft.

CORYANTHES Hook.
C. Hunteriana Schltr. No. 19. Panama, hills near city. S. L.
C. Powellii Schltr. No. 158. Panama, hills near city. S. L.

CORYMBIS Thou.
C. flava Hemsl. Panama.

CRYPTOPHORANTHUS Rodr.
C. Powellii Ames. No. 278. Panama, San Juan. S. L.

CYCNOCHES Ldl.
C. aureum Ldl. Panama.
C. Dianae Rchb. f. No. 186. Panama, Chiriqui Prov., Caldera River. 4000 ft.
C. guttulatum Schltr. No. 14. Panama, hills east of city. S. L.
C. pachydactylqn Schltr. No. 159. Panama, Chiriqui Prov. 5000 ft.
C. stenodactylon Schltr. No. 173. Panama, Chiriqui Prov. 3000-3500 ft.
C. Warscewiczii Rchb. f. No. 165. Panama, Chiriqui Prov. 2000-3000 ft.

DIACRIUM Ldl.
D. bilamellatum (Rchb. f.) Hemsl. No. 67. Panama, along Pacific Coast. S. L.

DICHEA Ldl.
D. panamensis Ldl. No. 175. Panama, near city. S. L.
D. Powellii Schltr. No. 23. Panama, near Bohio. S. L.
D. trichocarpa Ldl. Panama.

DIMERANDRA Schltr.
D. Isthmi Schltr. No. 17. Panama, hills near city. S. L.
ELLEANTHUS Presl.
E. Brenesii Schltr. No. 97. Panama, Chiriqui Prov. 4000 ft.
E. hymenaphorus Rchb. f. Panama.
E. laxus Schltr. Panama.
E. linifolius Presl. No. 353. Panama, Cativa, Porto Bello trail. S. L.
E. trifoliatus Ames. No. 421. Panama, San Juan, Chagres River. S. L.
ENCYCLIA Hook.
E. alata Schltr. No. 189. Panama, near Culebra, in hills, S. L.
E. atropurpurea Schltr. No. 148. Panama, hills east of city. S. L.
E. atropurpurea var. *leucantha* Schltr. No. 149. Panama, hills east of city. S. L.
E. atropurpurea var. *rhodoglossa* Schltr. No. 80. Panama, hills east of city. S. L.
E. atropurpurea var. *rhodoglossa* f. *laciniata* Ames. No. 287. Panama, hills east of city. S. L.
E. campylostalix (Rchb. f.) Schltr. No. 74. Panama, Chiriqui Prov. 4000-5000 ft.
E. chiriquensis Schltr. Panama.
E. Powellii Schltr. No. 83. Panama, Chiriqui Prov. 4000-5000 ft.
E. tessalata Schltr. No. 95. Panama, Chiriqui Prov., Caldera River. 4000 ft.
E. varicosa Schltr. Panama.
EPIDENDRUM L.
E. alanjenses Ames. No. 84. Panama, near David. S. L.
E. amandum Ames. No. 271. Panama, hills east of city. S. L.
E. anceps Jacq. No. 40. Panama, hills east of city. S. L.
E. bisulcatum Ames. No. 280. Panama, Chiriqui Prov. Palo Alto Hill. 6000 ft.
E. Brassavolae Rchb. f. Panama.
E. caligarium Rchb. f. No. 380. Panama, San Juan, Veraguas Prov. 1200 ft.
E. centropetalum Rchb. f. Panama.
E. chlorocorymbos Schltr. No. 82. Panama, Gatun Lake, hills east of city. S. L.
E. ciliare L. No. 100. Panama, Chiriqui Prov. 4000 ft.
E. colonense Ames. Panama, Colon Prov. "Rio Indio de fato." S. L.
E. confusum Rolfe. Panama.
E. coriifolium Ldl. No. 119. Panama, Chiriqui Prov. 4500 ft.
E. difforme Jacq. No. 259. Panama, Chiriqui Prov. 4000-4500 ft.
E. eburneum Rchb. f. Nos. 38 and 132. Panama, Gatun Lake and swamps near Colon. S. L.
E. equitantifolium Ldl. No. 206. Panama, hills near city. S. L.
E. floribundum var. (H. B. & K.) Ames. No. 233. Chiriqui Prov. 4000 ft.
E. fragrans Sw. Nos. 30 and 43. Panama, hills east of city; Gatun Lake. S. L.

E. fragrans Sw. var. *pachypus* No. 208. Panama, Chiriqui Prov. 4000 ft.
E. fuscopurpureum Schltr. No. 257. Panama, Chiriqui Prov. 4500 ft.
E. glandulosum Ames. No. 338. Panama, Cativa trail. S. L.
E. Hunterianum Schltr. No. 29. Panama, Gatun Lake. S. L.
E. imatophyllum Ldl. No. 138. Panama, hills near city. S. L.
E. incomptum Rchb. f. Panama.
E. ionophlebium Rchb. f. Nos. 310 and 384. Panama, Chiriqui Prov. 4000 ft.
E. Isthmi Schltr. No. 104. Panama, hills east of city. S. L.
E. latilabre Ldl. No. 249. Panama, Gatun Lake, hills near city. S. L.
E. Mooreanum Rolfe. No. 292. Panama, Chiriqui Prov. "Lino Hill." 4500 ft.
E. myodes Rchb. f. Nos. 188 and 242. Panama, Chiriqui Prov. 4000 ft.
E. nocturnum Jacq. Nos. 216, 217, var. 347. Panama, Gatun Lake, hills around city. S. L.
E. nocturnum Jacq. var. *panamense* Schltr. No. 35. Panama, Gatun Lake, hills east of city. S. L.
E. Oerstedii Rchb. f. No. 239. Panama, Chiriqui Prov. 4500 ft.
E. Ottonis Rchb. f. No. 131. Panama, hills east of city. S. L.
E. pachycarpum Schltr. Nos. 151 and 187. Panama, Chiriqui Prov. 4000 ft.
E. panamense Schltr. Panama.
E. piliferum Rchb. f. Panama.
E. platycardium Schltr. No. 141. Panama, Chiriqui Prov. 4000 ft.
E. porpax Rchb. f. No. 244. Panama, Chiriqui Prov. 4000-4500 ft.
E. porphyrophyllum Schltr. No. 183. Panama, hills east of city. S. L.
E. Powellii Schltr. No. 228. Panama, Chiriqui Prov. 4000 ft.
E. prismatocarpum Rchb. f. Nos. 99 and 101. Panama, Chiriqui Prov. 3500-4000 ft.
E. prorepens Ames. Nos. 152, 238, 381. Panama, Chiriqui Prov. 4000 ft.
E. pseudopidendrum Rchb. f. Panama.
E. pudicum Ames. No. 319. Panama, Chiriqui Prov. 4500 ft.
E. radicans Ruiz et Pav. var. *chiriquense* Schltr. No. 61. Panama, Chiriqui Prov., along roadside and open places. 4000 ft.
E. ramosum Jacq. No. 322. Panama, Chiriqui Prov. "Lino Hill." 4500 ft.
E. resectum Rchb. f. Panama.
E. rigidum Jacq. No. 352. Panama, Cativa, Porto Bello trail. S. L.
E. Rousseauae Schltr. No. 112. Panama, Chiriqui Prov. 4000-4500 ft.; hills east of city. S. L.
E. Schlechterianum Ames. No. 18. Panama, hills east of city. S. L.
E. sculptum Rchb. f. No. 116. Panama, Gatun Lake, hills near city. S. L.
E. simulacrum Ames. No. 298. Panama, Chiriqui Prov. "Lino Hill." 4000-4500 ft.

E. Stamfordianum. Batem. No. 33. Panama, hills east of city. S. L.
E. Stangeanum Rchb. f. Panama.
E. stenopetalum Hook. Panama.
E. strobiliferum Ames. Nos. 209, 350. Panama, San Juan range. S. L.
E. subpatens Schltr. No. 86. Panama, Gatun Lake, Veraguas Prov. S. L.
E. tenuiflorum Schltr. No. 49. Panama, Chiriqui Prov. 4000 ft.
E. teretifolium Sw. var. *Powellianum* Schltr. No. 240. Panama, Chiriqui Prov. 4000-4500 ft.
E. tetraceros Rchb. f. Panama.
E. turialvae Rchb. f. No. 323. Panama, Rio Indio, near mouth of Chagres River. S. L.
E. volutum Ldl. No. 89. Panama, Chiriqui and Veraguas Prov. 3500-4000 ft.
E. Warscewiczii Rchb. f. Panama.

ERYTHRODES Blume.
E. Killipii Ames. Panama, Chiriqui Prov., Rio Caldera. 4500-5000 ft.

EULOPHIA R. Br.
E. longifolia Schltr. No. 10. Panama, hills near city. S. L.

FREGEA Rchb. f.
F. amabilis Rchb. f. Panama, Chiriqui Prov.

GONGORA Ruiz & Pav.
G. aromatica Rchb. f. Nos. 32, 69, 71, 93. Panama, hills near city. S. L.
G. Powellii Schltr. No. 76. Panama, hills near city. S. L.
G. tricolor Rchb. f. Nos. 63, 70, 176.

GOVENIA Ldl.
G. Powellii Schltr. No. 205. Panama, Chiriqui Prov. 4000 ft.

HABENARIA Willd.
H. alata Hook. Nos. 316, 317, 318, 321. Panama, near city. "Casa lago." S. L.
H. avicula Schltr. No. 162. Panama, hills near city. S. L.
H. bicornis Ldl. No. 315. Panama, near Tecumen. S. L.
H. petalodes Ldl. Nos. 266, 326, 327, 328, 330, 331, 336, 337, 339. Panama, near city. S. L.
H. Warscewiczii Schltr. No. 212. Panama, hills near city. S. L.

HEXISIA Ldl.
H. bidentata Ldl. No. 68. Panama, Chiriqui Prov. 3000 ft.
H. oppositifolia Rchb. f. No. 333. Panama, San Juan range, S. L.

HEXADESMIA Brongn.
H. micrantha Ldl. Panama.
H. pachybulbon Schltr. No. 229. Panama, Chiriqui Prov. 4500 ft.
H. Powellii Schltr. No. 225. Panama, Chiriqui Prov. 5000 ft.

IONOPSIS H. B. & K.
I. utricularioides Ldl. No. 181. Panama, hills near city. S. L.

ISOCHILUS R. Br.
I. chiriquensis Schltr. No. 98. Panama, Chiriqui Prov. 4500 ft.

KEFERSTEINIA Rchb. f.
K. lactea Rchb. f. Panama.

LAELIA Ldl.
L. rubescens Ldl. No. 64. Panama, N. W. Chiriqui Prov.

LEOCHILUS Kn. & West.
L. Powellii Schltr. No. 129. Panama, west of Canal. S. L.; near Arraijan. S. L.

LEPANTHES Sw.
L. chiriquensis Schltr. No. 254. Panama, Chiriqui Prov. 5000 ft.
L. Maxoni Schltr. Panama.
L. ociliate Schltr. Panama.

LEUCOHYLE Kl.
L. subulata Schltr. No. 241. Panama, upper Chagres River. S. L.

LIPARIS L. C. Rich.
L. elata Ldl. No. 243. Panama, hills east of city. S. L.

LOCKHARTIA Hook.
L. chiriquensis Schltr. Panama, Chiriqui Prov.
L. elegans Hook. Panama.
L. micrantha Rchb. f. No. 51. Panama, Chiriqui Prov. 4000 ft.
L. mirabilis Rchb. f. Panama.
L. multidentata Ames. No. 362. Panama, Chiriqui Prov. 4000 ft.
L. Oerstedii Rchb. f. No. 75. Panama, Chiriqui Prov. 3000-4000 ft.
L. pallida Rchb. f. No. 52. Panama, near city. S. L.
L. Pittieri Schltr. Panama.
L. triangulabia Ames. No. 362a. Panama, Chiriqui Prov. 4000 ft.
L. variabilis Ames. Nos. 355, 361, 372. Panama, Frijoles, Porto Bello trail, Ft. Sherman trail. S. L.

LYCASTE Ldl.
L. brevispatha Kl. No. 140. Panama, Chiriqui Prov. 4000-4500 ft.
L. macrophylla Ldl. No. 246. Panama, Chiriqui Prov. 4000-5000 ft.
L. Powellii Schltr. No. 15. Panama, hills near city. S. L.
L. tricolor Rchb. f. Panama.

MACRADENIA R. Br.
M. Brassavola Rchb. f. No. 357. Panama, Juan Diaz. S. L.

MASDEVALLIA Ruiz & Pav.
M. attenuata Rchb. f. No. 268. Panama, Chiriqui Prov. 4000-4500 ft.
M. Livingstoniana Roezl et Rchb. f. No. 273. Panama, near Arraijan, hills east of city. S. L.
M. Wagneriana Ldl. Panama.

MAXILLARIA Ruiz & Pav.
M. aciantha Rchb. f. No. 136. Panama, hills near city. S. L.
M. alba Ldl. No. 127. Panama, hills near city. S. L.

M. crassifolia Rchb. f. No. 118. Panama, Chiriqui Prov. 4000 ft.
M. chiriquensis Schltr. No. 125. Panama, Chiriqui Prov. 4000 ft.
M. diuturna Ames. No. 376. Panama, Cativa, Porto Bello trail. S. L.
M. gatunensis Schltr. No. 207. Panama, Gatun Lake. S. L.
M. longipetiolata Ames. No. 307. Panama. S. L.
M. nigrescens Ldl. Panama.
M. oreocharis Schltr. No. 256. Panama, Chiriqui Prov. 4000-5000 ft.
M. panamensis Schltr. No. 124. Panama, hills near city. S. L.
M. Powellii Schltr. No. 28. Panama, hills near city. S. L.
M. pubilabia Schltr. No. 214. Panama, Chiriqui Prov. 4000 ft.; hills near city. S. L.
M. Rousseauae Schltr. No. 115. Panama, Chiriqui Prov. 4000 ft.
M. stenostele Schltr. No. 120. Panama, hills near city. S. L.
M. vagans Ames. No. 348. Panama, Chiriqui Prov. "Palo Alto." 4500-5000 ft.

MICROSTYLIS Nutt.
M. blepharglottis Schltr. Panama.
M. Pittieri Schltr. Panama.

MILTONIA Ldl.
M. Endresii Nichols. Panama.

MORMODES Ldl.
M. atropurpureum Ldl. Nos. 193-197, 200-204, incl. Panama, Chiriqui Prov. 3500-4000 ft.
M. bucinator Ldl. Panama.
M. Hookeri Lem. Nos. 24, 96, 199. Panama, Chiriqui Prov. 3500 ft.; hills near city. S. L.
M. igneum Ldl. Nos. 88, 191, 192. Panama, Chiriqui Prov. 3500 ft.; hills near city. S. L.
M. Powellii Schltr. No 59. Panama, Gatun Lake and regions. S. L.

NOTYLIA Ldl.
N. bipartita Rchb. f. No. 401. Panama, Veraguas Prov. 1000 ft.
N. gracilispica Schltr. No. 185. Panama, hills near city. S. L.
N. latilabia Ames. No. 406. Panama, Frijoles hills. S. L.
N. pentachne Rchb. f. No. 81, 400. Panama, hills near city, S. L.
N. Pittieri Schltr. No. 405. Panama, Balboa, Arias hill. S. L.

OCTOMERIA R. Br.
O. costaricensis Schltr. No. 413. Panama, Cativa, Porto Bello trail. S. L.

ODONTOGLOSSUM H. B. & K.
O. cariniferum Rchb. f. No. 142. Panama, Chiriqui Prov. 4000-5000 ft.
O. chiriquense Rchb. f. Panama. Chiriqui Prov.
O. Powellii Schltr. No. 178. Panama, Chiriqui Prov. 3800 ft.
O. pulchellum Batem. Panama.

ONCIDIUM Sw.
O. ampliatum Ldl. No. 53. Panama, hills around city. S. L.
O. ansiferum Rchb. f. No. 145. Panama, Chiriqui Prov. 2000-3000 ft.
O. bracteatum Warsc. Panama.
O. bryolophotum Rchb. f. No. 48. Panama, Chiriqui Prov. 5000-5500 ft.
O. cebolleta Jacq. Panama.
O. cheirophorum Rchb. f. No. 54. Panama, Chiriqui Prov. 4000-5000 ft.
O. confusum Rchb. f. No. 267. Panama, hills east of city. S. L.
O. fulgens Schltr. No. 157. Panama, Chiriqui Prov. 4000-5000 ft.
O. Isthmi Schltr. No. 397. Panama, San Juan. S. L.
O. kymatoides Kraenzl. No. 270. Chiriqui. 4000-5000 ft.
O. nebulosum Ldl. No. 49. Panama, Chiriqui Prov. 4000-5000 ft.
O. ocmatochilum Rchb. f. No. 160. Panama, Chiriqui Prov. 4500 ft.
O. Oerstedii Rchb. f. var. *crispiflorum* Schltr. No. 1. Panama, Pacific Coast west of city. S. L.
O. onustum Ldl. Panama.
O. panamense Schltr. No. 4. Panama, hills near city. S. L.
O. peliograma Ldl. Panama.
O. polycladium Rchb. f. Panama.
O. Powellii Schltr. No. 58. Panama, Gatun Lake. S. L.
O. pusillum Rchb. f. No. 26. Panama, hills near city. S. L.
O. Reicheringerianum (Kraenzl) Ames. Nos. 161, 177.
O. stipitatum Ldl. Nos. 220, 375. Panama, hills near city. S. L.
O. teres Ames. No. 383. Panama, Veraguas Prov., San Francisco. 1000 ft.
O. Warscewiczii Rchb. f. Panama.

ORNITHIDIUM Salisb
O. anceps Rchb. f. No. 324. Panama, hills east of city. S. L.
O. conduplicatum Ames. No. 341. Panama, Chiriqui Prov. Palo Alto. 4000-5000 ft.
O. fulgens Rchb. f. No. 283. Panama, Upper Chagres River. S. L.

ORNITHOCEPHALUS Hook.
O. bicornis Ldl. Nos. 174, 368. Panama, hills near city. S. L.
O. lanuginosus Ames. Panama, near Tecumen River. 200 ft.
O. Powellii Schltr. No. 231. Panama, hills east of city, "San Juan." 100-300 ft.

OSMOGLOSSUM Schltr.
Osmoglossum acuminatum Schltr. No. 255. Panama, Chiriqui Prov. 5000 ft.

PAPHIOPEDILUM Pfitz.
P. longifolium Pfitz. No. 308. Panama, Chiriqui Prov. 4000 ft.

PERISTERIA Hook.
P. elata Hook. No. 213. Panama, hills near city. S. L.

PESCATOREA Rchb. f.
P. cerina Rchb. f. Panama.

PHRAGMOPEDILUM Rolfe.
P. Warscewiczianum Schltr. No. 153. Panama, Chiriqui Prov. 4000-5000 ft.

PHYSOSYPHON Ldl.
P. multiflorus Ames. No. 345. Panama, Chiriqui Prov. 4000 ft.

PLEUROTHALLIS R. Br.
P. alpina Ames. No. 282. Panama, Chiriqui Prov. "Jaramilla". 4500 ft.
P. aperta Ames. Nos. 245, 277. Panama, Chiriqui Prov.
P. arietina Ames. No. 288. Panama, Chiriqui Prov. 4000 ft.; "Cerro Horquita". 5000-5500 ft.
P. barboselloides Schltr. No. 92. Panama, hills east of city. S. L.
P. Brighamii S. Wats. No. 274. Panama, hills east of city. S. L.
P. canae Ames. Panama, Cana and vicinity. 6000 ft.
P. chiriquensis Schltr. No. 227. Panama, Chiriqui Prov. 4000-5000 ft.
P. diuturna Schltr. No. 172. Panama, Veraguas Prov. S. L.
P. dubia var *myriantha* (L. et K.) Schltr. No. 224. Panama, Caldera River, Chiriqui Prov. 4000-5000 ft.; No. 420. Panama.
P. ecrisepetala Ames. Chiriqui Prov. 4000-5000 ft.
P. falcatiloba Ames. Panama, Chiriqui Prov., Rio Quebrada. 5000 ft.
P. fulgens Rchb. f. Nos. 335, 340. Panama, Chiriqui Prov. "Horquita". 4000-4500 ft.
P. glandulosa Ames. No. 306. Panama, Juan Grande range. S. L.
P. gnomonifera Ames. No. 311. Panama, Chiriqui Prov. Cerro Horquita. 5000-6000 ft.
P. Octomeriae Schltr. No. 252. Panama, Chiriqui Prov. 5000 ft.
P. panamensis Schltr. No. 106. Panama, hills east of city. S. L.
P. perpusilla Rchb. f. Panama.
P. Powellii Schltr. No. 146. Panama, Chiriqui Prov. 4000 ft.
P. pyrsodes Rchb. f. No. 219. Panama, hills east of city. S. L.
P. spectabilis Ames. No. 382. Panama, Veraguas Prov., "Santa Fe". 1500 ft.
P. rhodoglossa Schltr. No. 182. Panama, hills east of city. S. L.
P. trachychlamys Schltr. No. 215. Panama, hills east of city. S. L.
P. verecunda Schltr. No. 91. Panama, hills east of city. S. L.
P. Wagnerii Schltr. Nos. 190, 236. Panama, Chiriqui Prov. 4000 ft.
P. Wercklei Schltr. Nos. 279, 289. Panama, Chiriqui Prov., "Palo Alto". 5500 ft.

POLYSTACHYA Hook.
P. Massayensis Rchb. f. No. 366. Panama, Cativa, Porto Bello trail. S. L.
P. panamensis Schltr. No. 122. Panama, hills east of city. S. L.
P. Powellii Ames. No. 343. Panama, Chiriqui Prov. 4000 ft.

PONTHIEVA R. Br.
P. racemosa Mohr. No. 356. Panama, San Juan. S. L.

PRESCOTTIA Ldl.
P. panamensis Schltr. Panama, Cerro Vaca, Chiriqui Prov. 2700-3300 ft.

RESTREPIA H. B. & K.
R. filamentosa Ames. No. 344. Panama, Chiriqui Prov. "Cerro Horquita". 5000-5500 ft.
R. Powellii Schltr. No. 123. Panama, Chiriqui Prov. 4000 ft.

RHYNCHOLAELIA Schltr.
R. glauca Schltr. Panama.

RODRIGUEZIA Ruiz & Pav.
R. secunda H. B. & K. var. *panamensis* Schltr. No. 79. Panama, hills near city. S. L.

ROLFEA Zahlbr.
R. Powellii Ames. No. 325. Panama, Juan Diaz. S. L.

SARCOGLOTTIS Presl.
S. Hunteriana Schltr. No. 147. Panama, hills east of city, S. L.
S. picta Kl. Nos. 388-392, 394-395, 398, 399. Panama, various. S. L.
S. Powellii Schltr. No. 179. Panama, hills east of city. S. L.

SCAPHOSEPALUM Pfitz.
S. elasmatopus Schltr. Panama.
S. longirepens Ames. Panama, Rio Caldera. 6000 ft.

SCAPHYGLOTTIS Poepp. & Endl.
S. albida Schltr. Nos. 363, 368, 373, 374, 378, 395. Panama, San Juan, etc. S. L.
S. amethystina Rchb. f. No. 358, 360. Panama, Chiriqui Prov. Palo Alto. 4000-4500 ft.
S. Behrii Benth. & Hook. No. 211. Panama, hills east of city. S. L.
S. dolichophylla Schltr. No. 126. Panama, hills east of city, Arraijan. S. L.
S. laevilabium Ames. No. 370. Panama, Juan Diaz range, 180 ft.; San Juan range. S. L.
S. pauciflora Schltr. No. 359. Panama, Juan Diaz range. S. L.
S. Powellii Schltr. No. 134. Panama, Chiriqui Prov. 3000-4000 ft.
S. unguiculata Schltr. No. 105. Panama, hills east of city. S. L.
S. Wercklei Schltr. No. 349. Panama, San Juan range. S. L.

SCHOMBURGKIA Ldl.
S. Lueddemanii Prill. No. 170. Panama, near David, Chiriqui Prov. S. L., 200-300 ft.
S. tibicinus Batem. Panama.

SELENIPEDIUM Rchb. f.
S. Chica Rchb. f. No. 258. Panama, hills east of city. S. L.

SIGMATOSTALIX Rchb. f.
S. costaricensis Rolfe. No. 230. Panama, Chiriqui Prov. 5000 ft.

SIEVEKINGIA Rchb. f.
S. suavis, Rchb. f. No. 379. Panama, Cativa trail. S. L.

SOBRALIA Ruiz & Pav.

S. Bletiae Rchb. f. Panama.
S. Fenzliana Rchb. f. No. 158. Panama, Chiriqui Prov. 4000 ft.
S. fragrans Ldl. No. 114. Panama, hills east of city. S. L.
S. epiphytica Schltr. No. 253. Panama, hills east of city. S. L.
S. labiata Warsc. et Rchb. f. Panama.
S. Lindleyana Rchb. f. Panama.
S. macrophylla Rchb. f. Panama.
S. panamensis Schltr. No. 21. Panama, Gatun Lake and others. S. L.
S. panamensis var *albiflos* Schltr. No. 31. Panama, hills near city. S. L.
S. Powellii Schltr. No. 2. Panama, Gatun Lake. S. L.
S. Rolfeana Schltr. f. No. 3. Panama, hills east of city, Gatun Lake. S. L.
S. suaveolens Rchb. f. Panama.
S. Warscewiczii Rchb. f. Panama.

SPIRANTHES L. C. Rich.

S. subpandurata Ames. No. 377. Panama, San Juan Chagres. S. L.

STANHOPEA Frost.

S. bucephalus Ldl. Nos. 295, 302, 303. Panama, hills near city. S. L.
S. Wardii var. *amoena* (Kl.) Schltr. No. 103. Panama, Chiriqui Prov., Caldera River. 4000 ft.
S. Warscewiczii Kl. Panama.

STENORRHYNCHUS L. C. Rich.

S. orchioides L. C. Rich. Nos. 300, 386, 387, 393, 396, 402, 404, 407, 408, 409, 410, 414-415. Panama, near Pacora. S. L.
S. speciosus L. C. Rich. No. 4. Panama.

STELIS Sw.

S. chiriquensis Schltr. Panama, Horquita. 6000-7000 ft.
S. crescenticola Schltr. No. 232. Panama, hills east of city, Arraijan. S. L.
S. eximia Ames. Nos. 312, 334. Panama, Chiriqui Prov. 4000-4500 ft.
S. inaequalis Ames. No. 272. Panama, San Juan. S. L.
S. longipetiolata Ames. Panama, Chiriqui Prov. 6000-7000 ft.
S. Maxoni Schltr. Panama, Chiriqui Prov. 4500-5000 ft.
S. panamensis Schltr. Panama, Marmoni River, 500-1200 ft.
S. perplexa Ames. No. 290, 293, 294, Panama, Chiriqui Prov. 4500-5000 ft.
S. Powellii Schltr. No. 247. Panama, Chiriqui Prov. 4000 ft.
S. Williamsii Ames. No. 180. Panama, hills east of city. S. L.

TRICHOCENTRUM Poepp. & Endl.

T. panamensis Rolfe. No. 371. Panama. Ft. Sherman trail. S. L.

TRICHOPILIA Ldl.
T. maculata Rchb. f. Panama.
T. marginata Henfr. Nos. 65, 66, var. *alba*, No. 154. Panama, Chiriqui Prov. 3800-4000 ft.
T. Powellii Schltr. No. 9. Panama, mango trees near city. S. L.
T. suavis Ldl. No. 75, var. *alba*, No. 135, Panama, Chiriqui Prov. 4000-5000 ft.

TRIGONIDIUM Ldl.
T. Seemanni Rchb. f. No. 44. Panama, hills near city. S. L.

TRIPHORA Nutt.
T. Wagneri Schltr. Panama, Chiriqui Prov. and Veraguas Prov.

TRIZEUXIS Ldl.
T. falcata Ldl. No. 286. Panama, Chiriqui Prov. Concepcion. 800 ft.

VANILLA Mill.
V. pompona Schiede. No. 137. Panama, hills east of city. S. L.

WARSCEWICZELLA Rchb. f.
W. aromatica Rchb. f. No. 248. Panama, Chiriqui Prov. 4500-5000 ft.
W. discolor Ldl. No. 77, var. 155. Panama, Chiriqui Prov. 4000-5000 ft.

XYLOBIUM Ldl.
X. elongatum Hemsl. No. 167. Panama, Chiriqui Prov. 3800 ft.
X. Powellii Schltr. No. 117. Panama, Chiriqui Prov. 4000 ft.
X. stachyobiorum Hemsl. No. 27. Panama, hills near city. S. L.

INQUIRIES RECEIVED JUNE 15-AUGUST 31, 1926

St. Louis:

Kind of grass to plant and treatment of lawns	6
Kind of trees and shrubs to plant, where to obtain, how to grow them	4
Information on water-lilies	2
Identification of plant diseases and remedies for same	10
How to get rid of insect pests	14
Information on soils and fertilizers	8
Identification of plants, shrubs, trees, vines	13
Culture of plants	16
Advice on flower shows	2
Information on importing plants	1
How to collect seed	2
Cause of plants dropping leaves (due to drought)	6
Names of orchid collectors in South America	1
Request for plants	2
Information from library	7
Requests for certain BULLETINS	8
Information on School for Gardening	4
Library consulted by students from Washington University	1

Arkansas:
Address of maker of colored plates.
Cut flowers for decorating hall.
Information on fall dahlia show.
Information about type specimens in herbarium.

California:
Request for teacher of botany.
Information on method of importing plants.

Colorado:
Information on Colorado lichens.
Information on Colorado fungi.

Florida:
Identification of plants..... 3
Request for plant.
Request for man to fill position.
Identification of banana.

Georgia:
Identification of palm pollen.

Illinois:
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Identification of plants.
Request for plants.
Information on School of Botany.

Oklahoma:
Information on lawns.
Identification of plants..... 2

Tennessee:
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Treatment of water-lilies.
Advice on autumn-flowering plants.
Plants for laboratory work.

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Washington:
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Books borrowed.
Garden publications requested.

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Japan:
Information about certain plant.

NOTES

Dr. George T. Moore, Director of the Garden, has been elected to membership in the executive committee of the Institute for Research in Tropical America.

Mr. George H. Pring, Horticulturist to the Garden, acted as judge of the floriculture exhibit at the Midwest Fair, at Fairmount Park, Madison Co., Ill., August 31.

Over 15,000 orchid plants were successfully removed from the greenhouses at the Garden to the orchid houses at Gray's Summit, during the latter part of August.

Miss Esther L. Larsen, Jesse Barr Research Fellow, spoke before the students of the high school at Minot, North Dakota, on "The Missouri Botanical Garden."

The August number of the "Orchid Review," the leading orchid journal of the world, published in England, contains an article on "The Missouri Botanical Garden and the Powell Orchid Collection."

The "Scientific Monthly" for August contains a paper on "How Plants Behave when Diseased," by Dr. B. M. Duggar, Physiologist to the Garden.

Mr. George H. Pring, Horticulturist to the Garden, spoke before the Lions Club, at the American Annex, June 23, on "The Effect of Smoke Upon Plants"; and before the chautauqua meetings at Piasa, Illinois, on "The Economic Products of Trees," August 16, and on "Native Plants," August 17.

Dr. George T. Moore, Dr. B. M. Duggar, Dr. J. M. Greenman, and Dr. Roland La Garde attended the meetings of the International Congress of Plant Sciences at Ithaca, New

York, August 16-23. Dr. Duggar presented an invitation paper before the section of pathology of the congress, August 18, on "The Nature of Mosaic Diseases," and led a round-table discussion before the section of physiology, August 21, on "The Physical Chemistry of Protoplasm."

Visitors to the Garden during the summer months include Prof. Al. Borza, of the University of Cluj, Cluj, Roumania; Prof. John T. Buchholz, of the University of Texas, Austin, Texas; Prof. L. P. Gainey, of Kansas Agricultural College, Manhattan, Kansas; Dr. H. A. Gleason, of the New York Botanical Garden; Mr. Goro Ida, of the Botanical Institute, Tokyo Imperial University; Prof. Alice L. Kibbe, of Carthage College, Carthage, Illinois; Dr. A. W. Hill, Director of the Royal Botanic Gardens, Kew, England; Mr. James Lambert, horticulturist in charge, Pennsylvania Botanical Garden, University of Pennsylvania, Philadelphia; Dr. and Mrs. L. O. Overholts, of Pennsylvania State College, State College, Pennsylvania; Prof. E. B. Payson, of the University of Wyoming, Laramie, Wyoming; Mr. C. W. Powell, of the Tropical Station, Missouri Botanical Garden, Balboa, Canal Zone; Prof. Harold St. John, of the State College of Washington, Pullman, Washington; Mr. Harold Sandon, of the Rothamsted Experimental Station, Harpenden, England.

STATISTICAL INFORMATION FOR JUNE-AUGUST, 1926

GARDEN ATTENDANCE:

Total number of visitors in June	27,793
Total number of visitors in July	28,120
Total number of visitors in August	32,409

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts in June	258
Total number of plants and seed packets received as gifts in July	159
Total number of plants and seed packets received in exchange in August	286

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June	31
Total number of books and pamphlets donated in June	103
Total number of books bought in July	23
Total number of books and pamphlets donated in July	248
Total number of books and pamphlets bought in August	9
Total number of books and pamphlets donated in August	311

HERBARIUM ACCESSIONS:

JUNE

By Gift—	
Allen, Mrs. James F.—Herbarium specimens of cultivated plants	4
Bettis, Mrs. James R.—Plants of Missouri	3
Elrod, Mrs. W. D.—Plants of Oklahoma	13
Greenman, J. M.—*Callirhoë involucrata* (T. & G.) Gray from Missouri	1
Hincke, H. W.—*Tephrosia virginiana* (L.) Pers. var. *holosericea* (Nutt.) Torr. & Gray from Illinois	1
Wolden, B. O.—*Senecio integerrimus* Nutt. from Iowa	1
Wulfing, J. W.—General collection of algae	1,092
By Purchase—	
Heller, A. A.—Plants of California	325
Henderson, Prof. L. F.—Plants of Oregon	180
Payson, Dr. Edwin B.—Plants of Wyoming	214
By Exchange —	
Epling, Dr. Carl C.—Plants of Idaho, Oregon and Peru	469
Hungarian National Museum, by Dr. Ferd. Filarszky—Plants of Hungary	107
New York Botanical Garden—Plants of Porto Rico and Trinidad	18
U. S. National Museum, by Dr. J. N. Rose—Plants of Mexico	2
Total	2,440

JULY

By Gift—	
Buchholz, Dr. John T.—*Juniperus occidentalis* var., from Arkansas	1
Buchholz, Dr. John T.—Water-colored illustrations of *Talinum calycinum* Engelm.	2
Churchill, Hon. Joseph R.—Plants of Massachusetts, Virginia and Pennsylvania	364
Day, Bertha A.—*Rumex crispus* L. from Canada	1
Elrod, Mrs. W. D.—*Neptunia lutea* Benth. from Oklahoma	1
Larsen, Miss Esther L.—Cultivated specimen of *Rhodotypos kerrioides* Sib. & Zucc.	1
McCurdy, Mrs. C. A.—*Pentstemon barbatus* Nutt., from Missouri	1
By Purchase—	
Broadway, W. E.—Plants of Trinidad	200
Seymour, Dr. Frank C.—Plants of Hampden County, Mass.	100
Weigel, Theo. Oswald—Plants of Uruguay, collected by Dr. Wm. Herter	180
By Exchange—	
U. S. National Museum, by P. C. Standley—Plants of Costa Rica	2
Total	853

AUGUST

By Gift—	
Glen Saint Mary Nurseries Co.—*Eriocaulon decangulare* L. from Florida	1
Hoch, Mrs. George C.—*Malva sylvestris* L. from Illinois	1
Ledman, O. S.—*Cucurbita foetidissima* HBK. from Missouri	1
Major, H. F.—*Cissus arborea* (L.) Des Moulins	1
Saur, B. C.—*Sedum mexicanum* Britt., cultivated specimen	1
By Exchange—	
O'Neill, O. S. B., Rev. Hugh—Plants of Florida	268
O'Neill, O. S. B., Rev. Hugh—Plants of Colombia	69
By Purchase—	
Botanical Museum, Berlin, Germany, by Dr. L. Diels—Steinbach's plants of Bolivia	250
Holzinger, John M.—Musci Acrocarpi Boreali-Americani et Europaei, Fasc. 24, Nos. 576-600 inclusive	25
Porsild, Dr. Morten P.—Plants of Greenland	230
Total	847

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the board so constituted, exclusive of certain *ex-officio* members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises about 75 acres. There is now in process of development a tract of land of over 1500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden. About 12,000 species of plants are growing in the Garden.

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset; from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

STAFF
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Orchids

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Herbaceous and Nursery

J. ULRICH,
Inside Floral Display

H. VALLENTINE,
Carpenter

Missouri Botanical Garden Bulletin

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THOMAS JEFFERSON: NATURALIST

It is hard to imagine the President of the United States hurrying to the front door of the White House every morning and gravely noting down the temperature and the direction of the wind for the official records. Nor do we expect the Vice-President to present an outstanding paper before one of our leading scientific societies. Even the most versatile president would hardly be suspected of having invented a new and useful plow or of having introduced new crop plants into the southern states. Yet these are but a few of the things for which Thomas Jefferson found time in the midst of his busy life as a public servant.

From the time of his election to the House of Burgesses, as a young man of 26, until his death, at the venerable age of 83, we find him using his spare minutes to further those studies which he himself termed his "supreme delight." During February, 1801, when there had been a tie vote and Congress was trying to decide whether Jefferson or Burr should be the next president of the United States, Jefferson was corresponding actively with Dr. Wistar in regard to certain fossils recently discovered on Shawangunk Mountain, N. Y. During the early days of the French revolution when he was in Paris as American minister, we find him, in the midst of a disrupted nation, proceeding with his attempts to introduce the olive, the cork oak, and other economic plants into Georgia and the Carolinas. Again and again in his letters we find references like the following: "Your first (letter) gives me information in the line of Natural History and the second promises political news. The

first is my passion, the last my duty; and therefore both are desireable."

Jefferson came naturally by these tastes. His father was interested in mathematics, and with Professor Fry of William and Mary College, made and published the first accurate map of Virginia. His mother was a daughter of Isham Randolph, who had more than a local reputation as a botanist and was a friend of John Bartram of Philadelphia, the founder of the first botanical garden in America. Jefferson's father died when he was fourteen, and the management of the estates soon passed into his hands. After graduating from college he designed and built his new home, Monticello, on a hill overlooking the beautiful Charlottesville valley. To Monticello he shortly afterwards brought his young bride and there he returned whenever his exacting duties as a public servant gave him the opportunity.

Typical of the interest which Jefferson took in his farm is the following extract from a letter written to President Washington shortly after Jefferson resigned as Secretary of State:

> "I have determined on a division of my farm into six fields, to be put under this rotation; first year, wheat; second, corn, potatoes, peas; third, rye or wheat, according to circumstances; fourth and fifth, clover where the fields will bring it, and buckwheat dressing where they will not; sixth, folding, and buckwheat dressings."

Two years later he sends Washington a preliminary report on the success of his crop rotation:

> "I think I have had, both the last and present year, as good clover from common ground, which had brought several crops of wheat and corn without ever having been manured, as I ever saw on the lots around Philadelphia. * * * The true winter vetch is what we want extremely. I have tried this year the Caroline drill; it is absolutely perfect: nothing can be more simple, nor perform its office more perfectly for a single row. I shall try to make one to sow four rows at a time of wheat or peas, at twelve inches distance. I have one of the Scotch threshing machines nearly finished. It is copied exactly from a model Mr. Pinckney sent me, only that I have put the whole works, except the horse wheel, into a single frame, movable from one field to another on the two axles of a wagon. It will be ready

in time for the harvest which is coming on, which will give it a full trial. Our wheat and rye are generally fine, and the prices talked of bid fair to indemnify us for the poor crops of the two last years.

"I take the liberty of putting under your cover a letter to the son of the Marquis de la Fayette, not exactly knowing where to direct to him.

"With very affectionate compliments to Mrs. Washington, I have the honour to be," etc., etc.

An interesting sidelight this letter throws on two of the most important figures in the early history of our country, Thomas Jefferson and George Washington writing each other about cover crops, threshing machines, and crop rotation, and the price of wheat. Perhaps the comment should be added that Jefferson was a century ahead of many of his fellow farmers in practicing crop rotation and in plowing under such green manures as winter vetch.

Nor was this the only point on which Jefferson was, as a farmer, ahead of his time. In 1803, over 50 years before the first agricultural college was established, we find him writing of agriculture in the following words: "It is a science of the very first order. It counts among its handmaids the most respectable sciences, such as Chemistry, Natural Philosophy, Mechanics, Mathematics generally, Natural History, Botany. In every College and University, a professorship of agriculture and the class of its students might be honoured as the first."

What was probably his most practical contribution to agriculture was devised during his later years in Paris. In his travels he had been impressed with the effort wasted by the ploughs then in use. He set to work to design a mouldboard (the curving portion of the ploughshare) which would turn over the earth with a minimum of resistance. His new plough was a great success. His farmer-overseer, Bacon, tells us that it "was considered a great improvement on any that had ever been used" and that Jefferson "got a great many premiums and medals for it."

In laying out Monticello, Jefferson showed his genius as a designer of landscapes. One of our most prominent American landscape architects, Mr. Warren Manning, has studied the

estate from a professional point of view and sums up his criticism in the following words:

"Study the topography of this section and you will see that he selected the most commanding of its conveniently accessible sites, certainly the finest site of his father's thirty thousand acres. He clearly recognized in the beginning the natural beauty of the site, the relation that the house, its approaches, and the outdoor compartment about it should bear to this beauty as well as to the convenience and comfort of his family and his visitors." Mr. Manning points out that the main road into the estate was so routed that the "mountains are made to appear very high by this view over the deep valley and its steep slopes, and between a flaring frame of tall trees, whereas over flat land from the same elevation they would have been rather unimpressive high hills." The same skill was shown in designing the approach to the house itself so that at the north front the location is "just far enough back from the point of the ridge summit to make way for a sweep of gently sloping lawn where a large party of people could gather, turn, and move about," while "the sunny south lawn was the home lawn where Jefferson and his family were completely protected from the intrusion of visitors." In achieving these effects Jefferson was not a lucky amateur stumbling in the dark, but a trained architect and gardener who had studied the best authorities of his time and then used his own good taste. In the spring of 1886 he made a tour of English gardens for the purpose of enabling himself "to estimate the expense of making and maintaining a garden in that style." He carried with him Whateley's book on "Modern Gardening," the best authority of the time, and jotted down in his notebook such observations as the following:

"Paynshill—Mr. Hopkins. Three hundred and twenty-three acres, garden and park all in one. Well described by Whateley. Grotto said to have cost £7,000. Whateley says one of the bridges is of stone, but now both are of wood, the lower sixty feet high; there is too much evergreen. The dwelling house built by Hopkins, ill-situated; he has not been there in five years. It is not finished; its architecture is incorrect."

Jefferson's first scientific work of any importance was his "Notes on Virginia" written during two periods of enforced inactivity. It is ambitiously encyclopaedic and treats of the state's history, geography, natural resources, industries, population, and laws. Among other features of particular interest is a chapter on the flora of the state, with lists of the outstanding wild and cultivated plants. Particular notice is taken of the Pecan, which is listed as:

> "Paccan, or Illinois nut. Not described by Linnaeus, Miller, or Clayton. Were I to venture to describe this, speaking of the fruit from memory, and of the leaf from plants of two years' growth, I should specify it as the Juglans alba, foliolis lanceolatis, acuminatis, serratis, tomentosis, fructu minore, ovato, compresso, vix insculpto, dulci, putamine tenerrimo. It grows on the Illinois, Wabash, Ohio, and Mississippi. It is spoken of by Don Ulloa under the name of Pacanos, in his Noticias Americanas. Entret 6."

The weather was one of Jefferson's main scientific interests. At home or abroad, it was his custom to note down the temperature at least once in the morning and once in the afternoon. Even the writing of the Declaration of Independence was not too important to interrupt his daily record. In his almanac Diary for 1776 we find the following entries for July 4, 1776, written in the same clear copperplate script as the Declaration itself:

	Hour	Therm.
July 4	6:00 A. M.	68°
	9:00 A. M.	72¼°
	1:00 A. M.	76°
	9:00 P. M.	73½°

He was interested in theories of storm movement and weather changes. For a period of years he, at Monticello, and Professor Madison, at Williamsburg, made simultaneous observations of temperature, pressure, and rainfall. Several noteworthy discoveries were made and were discussed in the "Notes on Virginia" and before the American Philosophical Society. One of our leading present-day meteorologists, Alexander McAdie, has said of these observations: "These two colonial gentlemen operated a weather service; on a small scale it is true, but the observers seem to have clearly

recognized that great underlying principle of all modern weather bureaus, the taking of observations *simultaneously*. This * * * removes the palm of priority from France to our own country. True no map was issued; but * * the principle which makes the map possible was thought out and tried with the best agencies at hand. Had the telegraph been in existence, there is no telling what these acute-minded colonists would not have attempted."

Jefferson's most ambitious scientific paper was on the subject of paleontology. When messengers arrived at Monticello to notify him of his election to the vice-presidency, they found him studying a collection of fossil bones which had recently been unearthed at Green Brier, Virginia. Shortly afterwards when he went up to Washington to take the oath of office, he carried with him, carefully packed under his personal supervision, these same fossil bones. On March 10 we find him discussing them before the American Philosophical Society under the title, "A Memoir of the Discovery of Certain Bones of an Unknown Quadruped of the Clawed Kind, in the Western Part of Virginia." This was the first paper on paleontology delivered in America. During the winter of 1808 Jefferson had brought up to Washington some 300 fossil bones from Big Bone Lick. They were spread out in one of the great unfinished rooms of the executive mansion. Dr. Wistar came up from Philadelphia to select what was needed to complete the collection of the American Philosophical Society, and the remainder were sent to scientific institutions in Paris.

However much posterity may have forgotten Jefferson's attainments, he received adequate recognition from the scientists of his own time. He was early elected a member of the American Philosophical Society and served for 18 years as its president. In his later years he was an active or honorary member of nearly every scientific society then existing in the United States. Appreciation was not so flattering on the part of the general public. By many he was regarded as a dangerous visionary who might better have spent his spare time on the job for which he had been elected. The popular attitude is reflected by a bit of doggerel written for

the newspapers by William Cullen Bryant, then a precocious boy in his early teens.

> "Go, wretch, resign the presidential chair,
> Disclose thy secret measures foul or fair.
> Go, search with curious eyes for horned frogs
> Mid the wild wastes of Louisianian bogs;
> Or, where the Ohio rolls his turbid stream,
> Dig for huge bones, thy glory and thy theme."

In his public as well as his private life, Jefferson's interest in natural history played an important part. As minister to France he served as an intermediary between the naturalists of both countries. He corresponded during this time with the presidents of four American colleges, Harvard, Yale, William and Mary, and the College of Philadelphia, advising them of the latest discoveries in science and the arts. He kept up a vigorous correspondence with naturalists in both countries, in which he discussed everything from the size of North American mammals to the success of James Watt's device for extracting power from steam. He was particularly interested in introducing American plants into Europe and European plants into America. To France he gave the pecan, importing the nuts by the bushel and recommending that they be grown in regular orchards like fruit trees. Of the numerous plants introduced into the United States, he considered upland rice the most important. When, as an old man, he listed for his family the services he had performed for his country, he wrote as follows of his introduction of upland rice:

> "In 1790, I got a cask of heavy upland rice from the River Denbigh, in Africa, about Latitude 9° 30′ North, which I sent to Charleston, in hopes it might supersede the culture of the wet rice, which renders South Carolina and Georgia so pestilential through the summer. It was divided and a part sent to Georgia, I know not whether it has been attended to in South Carolina; but it has spread in the upper parts of Georgia, so as to have become almost general, and is highly prized. Perhaps it may answer in Tennessee and Kentucky. The greatest service which can be rendered a country is, to add an useful plant to its culture."

As President he was responsible for the exploration trips which were sent out into the newly purchased Louisiana Ter-

ritory. Nicholas Biddle, at the memorial service held by the American Philosophical Society 100 years ago next April, says:

> "Of these the first in order and importance was the expedition of Lewis and Clarke to the Pacific Ocean. This had always been a favorite object of his contemplation. . . . Whilst minister in Paris, he proposed to Ledyard, the celebrated traveller, to cross from Kamschatka to Nootka Sound and ascending thence to the latitude of the Missouri, proceed by that river to the United States. Ledyard embarked with great zeal in this adventure and having obtained through the instrumentality of Jefferson the sanction of the Empress Catherine, proceeded on his journey; but when he had reached the neighborhood of Kamschatka, he was arrested and sent back into Poland by some caprice or suspicion of the Russian government. In the year 1792 Jefferson proposed to our society to raise by subscription a fund to engage some person to ascend the Missouri, and cross the mountains to the Pacific, and Mr. André Michaux was employed for that purpose; but when he had proceeded as far as Kentucky he, too, was recalled by an order of the French minister. Not discouraged by these failures, on his elevation to the presidency he renewed the subject, and having obtained the necessary sanction from Congress fitted out the expedition of Lewis and Clarke for the same purpose. Their instructions, written with his own hand, are among the most interesting of his works. They were already prepared and the party about to undertake their journey when the cession of Louisiana to the United States gave it additional interest and attraction. To this expedition were added those of Major Pike to the sources of the Mississippi and afterwards to the Arkansas, of Colonel Freeman up the Red River, and Messrs. Hunter and Dunbar up the Washita. The particulars of these journeys were conveyed to the public in many works, which, containing as they do, descriptions of regions, the greater part of which had never been described nor even visited by civilized men, produced large acquisitions as well to geography as to the other sciences, of all which the merit is especially due to the projector of them."

The instructions mentioned by Biddle are none the less interesting after the passage of a century. They show that Jefferson was responsible for the scientific thoroughness of the expedition. He goes extensively into detail, writing Captain Lewis:

> "The object of your mission is to explore the Missouri river and such principal streams of it, as by its course and communication with the waters of the Pacific ocean, whether the Columbia, Oregon, Colorado, or any other river, may offer the

most direct and practicable water communication across the continent for the purpose of commerce.

"Other objects worthy of notice will be,

"the soil and face of the country, its new growth and vegetable productions, especially those not of the United States, the animals of the country generally and especially those not known in the United States, the remains and accounts of any which may be deemed rare or extinct;

"the mineral productions of every kind, but particularly metals, limestone, pit-coal, and salt-petre;

"salines and mineral water, noting the temperatures of the last, and such circumstances as may indicate their character;

"climate as characterized by the thermometer, by the proportion of rainy, cloudy, and clear days, by lightning, hail, snow, ice, by the access and recess of frost, by the winds prevailing at different seasons, the dates at which particular plants put forth or lose their flower or leaf, times of appearance of particular birds, reptiles, or insects."

Agriculture, horticulture, paleontology, meteorology, ethnology, landscape architecture; somehow the busy man found time for them all. To each he brought a vigorous and disciplined mind. To each he made substantial contributions. He was in the truest sense of the word a naturalist. His interest in the world about him was deep and abiding. This can perhaps be no better illustrated than by quoting from a letter written during one of the hottest fights of his political career. Hamilton, the Federalist, and Jefferson, the Democrat, were organizing their forces for mortal political combat. With his close friend and political lieutenant, James Madison, Jefferson took a vacation trip by stagecoach through New England and the Hudson valley. To his family he sent frequent reports of the progress of the trip. The following letter is typical. It is the letter of a man whose interest in nature was too deep-set to be pushed from the foreground by a mere political crisis.

"Bennington, in Vermont, June 5, 1791. We have also visited Forts William Henry and George, Ticonderoga, Crown Point, etc., which have been scenes of blood from the very early part of our history. We were more pleased, however, with the botanical objects which continually presented themselves. Those unknown or rare in Virginia were the sugar maples in vast abundance, the silver fir, white pine, pitch pine, spruce pine, a shrub with decumbent stems which they call juniper,

an azalea (very different from the nudiflora, with very large clusters of flowers, more thickly set on the branches, of a deeper red, and high pink-fragrance). The honeysuckle of the gardens growing wild on the banks of Lake George, the paper-birch, an aspen with a velvet leaf, a shrub willow with downy catkins, a wild gooseberry, the wild cherry with single fruits (not the bunch cherry), strawberries in abundance."

A NEW HYBRID WATER-LILY

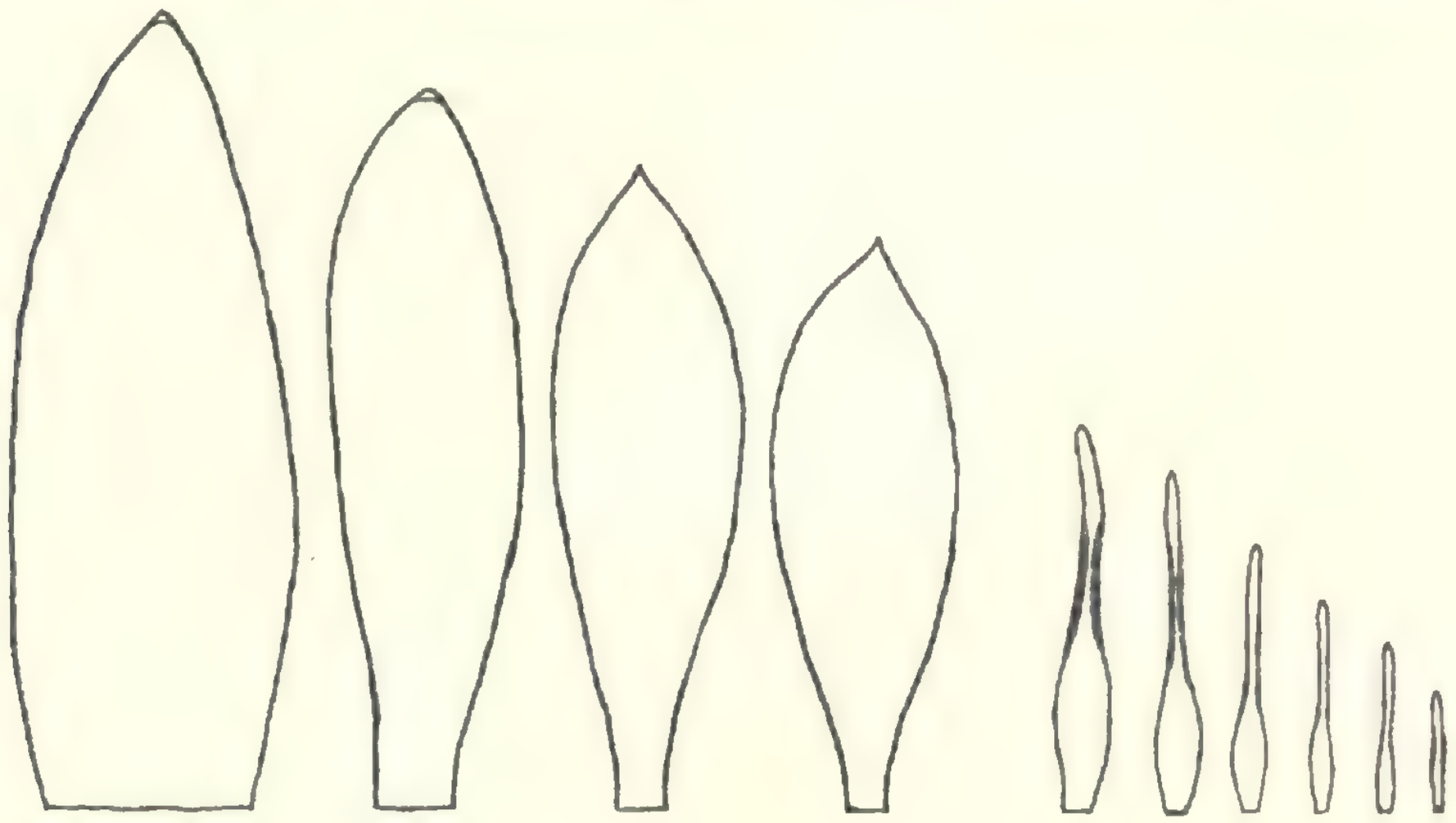
NYMPHAEA "EDWARD C. ELIOT"

Since 1912 Mr. Pring, Horticulturist at the Garden, has been experimenting with the Brachyceras group of Nymphaeae with the idea of producing new varieties. The development of the Whitaker type with its variety *marmorata* introduced to gardens a new type of tropical day-blooming water-lilies, and these are now grown extensively in both tropical and subtropical garden collections throughout the world. Up to the present time eight new hybrids have been originated at the Garden, including the pure white "Mrs. G. H. Pring," which has the distinction of being the first albino hybrid of the tropical day-blooming water-lilies.

The hybrid "Mrs. Edwards Whitaker" var. *marmorata* introduced an entirely new factor, namely, that of having the leaf striped or marmorated with reddish brown on the upper surface. The subsequent hybrids, such as "General Pershing," "Mrs. G. H. Pring," and "Henry Shaw," have not shown this peculiar coloration, producing the normal green leaves of the original parent *castaliiflora.*

During 1923 crosses were made in an attempt to produce this same coloration in a pink-flowered variety. "Mrs. Edwards Whitaker" var. *marmorata* was pollinated, and several hundred seedlings were raised during the following season. From these there was selected a form having an intensified leaf coloration resembling the original seed parent but with the pink flowers of *castaliiflora.* This well-marked variety has been named "Edward C. Eliot" in honor of the President of the Board of Trustees of the Missouri Botanical Garden.

Description.—Flowers 8–10 inches across, opening 5–6 successive days from 7 A. M. to 6:30 P. M. during August, extremely fragrant; bud ovate to ovate-conical, light green spotted with pinkish red; peduncle brown, rising 1 foot above the water, in cross-section showing 7 main air-canals circled by 14 smaller ones, these again irregularly surrounded by still smaller air-canals; sepals wedged, ovate, 4½ inches long, 1½ inches wide, hooded at the apex, thick, fleshy in texture, outer surface parrot-green, irregularly striped with reddish pink, pale amaranth-pink on the margins, inner sur-



NYMPHAEA "EDWARD C. ELIOT."

face pale amaranth-pink, light green at the base, showing 13 nerves; petals 36, comprising three whorls, the outermost broadly lanceolate, obtuse, slightly hooded at the apex, 4 inches long, 1 inch wide, with the outer surface pale amaranth-pink, thick in texture except along the margins, 7 8-nerved, and the inner surface pale amaranth-pink, the inner whorls pale amaranth-pink, slightly acute, becoming shorter; stamens 200, outermost whorl 2 inches long with appendages ovate-oblong at the base, lemon-yellow, pale amaranth-pink

at the apex, the inner whorls shorter and narrower toward the innermost, which is linear and almost entirely lemon-yellow; carpels 36–40, with styles oblong, obtuse, introrse, lemon-yellow; fruit globose, containing numerous fertile seeds; leaves of submerged seedling light green, broadly triangular, with acute lobes, first floating leaves orbicular, pink on the under side, upper surface prominently marmorated with reddish brown; developed leaves orbicular, 16–18 inches across, peltate, obtusely sinuate-dentate, dark green, prominently marmorated with reddish brown on the upper surface, spotted with reddish pink beneath, sinuses overlapping; petioles brown, often attaining a length of six feet when fully developed.

NOTES

The third number of Volume XIII of Annals of the Missouri Botanical Garden, containing the fifteenth and last installment of "The Thelephoraceae of North America" has recently been issued.

Dr. B. M. Duggar, Physiologist to the Garden, recently spent a few days at El Paso, Texas, where he was called to study some unusual effects of weather conditions on long-staple cotton under irrigation.

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Monday Club at Edwardsville, Illinois, October 4, on "Gardening"; and before the Men's Club at the Clifton Heights Presbyterian Church, October 12, on "The Effect of Smoke Upon Plants."

On their return from the western excursion of the International Congress of Plant Sciences, Professor and Mrs. N. Maximow spent a day at the Garden recently. Dr. Maximow is head of the department of physiology of the State University of Agronomy and physiologist to the Botanical Garden, Leningrad, Russia. Mrs. Maximow is associated in the same work.

The corner-stone of the Charles Rebstock Hall of Washington University was laid the afternoon of October 12. This

new building when completed will provide accommodations for all of the work in botany given on the campus in the Shaw School of Botany. Chancellor Hadley, Mr. W. Frank Carter, Prof. Caswell Grave, Mr. Charles Rebstock, and Dr. George T. Moore, Director of the Garden, took part in the exercises.

Bird lovers will be interested to know that an albino robin has been sighted again this fall. Three or four years ago there was apparently a brood of partial albino robins in the Garden. During the season there were seen at least three different birds which were variously blotched with white feathers. While they were never seen together, they were noticed in the same part of the Garden repeatedly by different observers. In succeeding years, as far as is known, only one of these birds has returned. He is very heavily marked with white over the head and shoulders—a bright, startling white, which gives him the appearance of having stuck his head in the flour barrel. Last fall he was seen during late September, again last spring, and during the last month he paid the Garden another visit.

The courtesy of the graduate laboratory is being extended during the present year to two holders of important fellowships: Dr. John N. Couch, B. A. University of North Carolina, 1919, Ph. D. University of North Carolina, 1924, assistant professor of botany, University of North Carolina, 1925—on leave of absence for two years—is the holder of a National Research Council fellowship in the biological sciences. He has been pursuing his investigation for one year at the Station for Experimental Evolution, Cold Spring Harbor, Long Island. Mr. Kazno Gotoh graduated in 1922 from the biological department, College of Agriculture, Hokkaido Imperial University, Sapporo, Japan. He was also a graduate student in the same institution 1922-1926 and now occupies the position of lecturer of botany in the college and is the holder of a special fellowship awarded by the International Education Board for foreign study.

STATISTICAL INFORMATION FOR SEPTEMBER, 1926

GARDEN ATTENDANCE:

Total number of visitors	21,384

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts	267

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	28
Total number of books and pamphlets donated	315

HERBARIUM ACCESSIONS:

By Gift—	
Irish, H. C.—Plants of Arizona	14
Ledman, O. S.—*Acer saccharum* Marsh var. *nigrum* (Michx.f.) Britton	1
Krebs, Mrs. Heinrich Ludwig—Plants of Ontario, Canada	8
Rothacker, Prof. R. R.—*Crataegus* sp. from Iowa	1
By Exchange—	
Philadelphia Academy of Natural Sciences—Plants of eastern United States	363
U. S. Department of Agriculture, by Prof. A. S. Hitchcock—North American Grasses, Cent. IX, Nos. 801-900	100
By Purchase—	
Botanical Garden and Museum, Berlin, Germany—Plants of Chile, collected by Dr. E. Werdermann	250
Mexia, Mrs. Ynez—Plants of Mexico	279
Total	1016

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the board so constituted, exclusive of certain *ex-officio* members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises about 75 acres. There is now in process of development a tract of land of over 1500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden. About 12,000 species of plants are growing in the Garden.

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset; from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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Missouri Botanical Garden Bulletin

Vol. XIV NOVEMBER, 1926 No. 9

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GOLDEN VARNISH TREE.
(Koelreuteria paniculata.)

Missouri Botanical Garden Bulletin

Vol. XIV NOVEMBER, 1926 No. 9

THE GOLDEN VARNISH TREE

A Summer Flowering Tree for St. Louis Gardens

No tree has any better cause for grievance against the botanists who named it than the golden varnish tree, *Koelreuteria paniculata* Laxm. Endowed by nature with more than one quality which might make it a popular garden subject, it still remains, a century and a half after its introduction into western gardens, comparatively unknown. In its native home in northern China its worth has long been recognized. In classical times it was planted on the graves of ministers of state. It is hardy, attractive in flower and fruit, and, most important for St. Louis gardens, resistant to smoke. Its only apparent handicap is the lack of an attractive name. Koelreuteria is an awkward combination of syllables. However much one may admire the worthy Professor Koelreuter, creator of the first scientifically produced plant hybrid, one wishes that his name might have been honored in some other fashion. As a popular name golden varnish tree is almost as bad. After all, there is something in a name. A rose by any other name might smell as sweet, but it certainly would not sell as well on the market.

Koelreuteria paniculata is a small, garden-size tree seldom exceeding 30 feet in height. The specimen shown in plate 34 is located in the Garden, near the mausoleum, and is by far the largest specimen ever seen by the writer. Younger trees are usually more regular in shape, with symmetrical crowns and straighter trunks.

The leaves are very similar to those of our native sumacs.

They are an attractive dark green and are often beautifully colored in the autumn. They are compound, each leaf composed of 7-15 leaflets, the edges of which are variously lobed and scalloped.

The chief glory of the tree is its flowers, which blossom during midsummer when little else is in bloom. They are small and bright yellow and borne in large panicles so profusely as to make the tree appear one huge bouquet. The seed-pods, which are large and inflated, are not unattractive and persist on the tree until almost midwinter. The seeds are small, round, and dark. In China they have sometimes been used as beads.

In St. Louis the tree has done unusually well. It is perfectly hardy and seems to be particularly resistant to smoke. A careful search will usually show vigorous young seedlings in the neighborhood of older trees. At the Garden two such spontaneous seedlings have been allowed to develop where they sprouted and are now lusty young trees. Were the tree more generally planted it is probable that it would eventually become naturalized in this country.

THE DAWSON ARBORETUM, WEBSTER GROVES, MISSOURI

More than one private garden has grown to such proportions as to become a public institution. Such was the origin of the Missouri Botanical Garden, and from the same humble beginnings have started many of the world's most notable gardens and arboreta. One of these private collections, which, while it has never been deeded to the public, is in point of fact almost a public institution, is the property known in Webster Groves as the Dawson Arboretum.

It had its beginnings over forty years ago when the late James P. Dawson began to collect all the trees and shrubs which would grow in this climate. As his estate was situated outside the smoke zone, with varying conditions of slope and moisture, he was able to bring together a very notable collection. Since his death the property has passed

MO. BOT. GARD. BULL., VOL. 14, 1926.

FLOWERS OF GOLDEN VARNISH TREE.

FRUIT OF GOLDEN VARNISH TREE.

ENGLISH MAPLE.
(Acer campestre.)

through various hands, and the collections of peonies and irises for which it was once famous have practically disappeared. However, the trees and shrubs still remain, and several of them are so rare, particularly in this part of the country, that the place is of more than local interest. It is easily accessible, being located just north of the Webster Park Station of the Missouri Pacific Railroad. The present owner, The Epworth Home for Girls, is interested in preserving the collection, and the superintendent is very gracious in permitting interested visitors to study it. Some of the more notable species are the following:

Abies concolor Lindl. & Gord. (white fir).—There are over a dozen specimens of this beautiful conifer in various parts of the grounds, and all are doing well. It is interesting to note in this connection that the white fir is one of the few western conifers which has been found to be thoroughly dependable at the Arnold Arboretum in Boston.

Acer campestre L. (English maple).—The Dawson Arboretum contains what is certainly the largest English maple in this region, if not in the country. Plate 36 shows the unusual size of this specimen, the English maple usually being seen here as a low bush.

Acer saccharum Marsh. var. *monumentale* (sentinel sugar maple).—The Lombardy poplar is not the only tree whose upward-pointed limbs give it the shape of a huge exclamation point. There are a number of similar forms, such as the columnar or "sentinel" beech, sentinel sugar maple, sentinel spruce, etc., but they are less commonly grown. Plate 37 shows one of the sentinel sugar maples, of which the Dawson Arboretum has three in excellent condition.

Acer tataricum L. (Tartarian maple).—This beautiful little tree looks somewhat like an unnaturally dwarfed red maple. There is one tree in excellent condition.

Acer pseudo-platanus L. (sycamore maple).—Three trees. Condition excellent.

Chamaecyparis pisifera Sieb. & Zucc. (Sawara cypress).—This handsome evergreen does not do well in this locality, as shown by the Dawson plantings. There are six specimens but only one is in good condition.

Euonymus radicans Sieb. (evergreen bittersweet). — This is an evergreen vine, with attractive fruit, and one of the most interesting plants in the collection. It has been very much used in eastern gardens, but has not been considered hardy around Saint Louis. Plate 38 shows how well it has done at the main entrance of the house.

Fagus sylvatica L. (European beech). — One tree. Fine condition.

Fagus sylvatica var. *pendula* (weeping beech).—One tree. Fine condition.

Juniperus chinensis L. (Chinese juniper).—This beautiful evergreen has spread over an entire hillside and is in excellent condition.

Koelreuteria paniculata Laxm. (golden varnish tree).—Three trees in fine condition.

Magnolia tripetala L. (umbrella magnolia).—Five trees in fine condition.

Tsuga canadensis Carr. (hemlock).—Three trees in excellent condition. They are somewhat sheltered from the sun, but, on the other hand, they are very close to the railroad tracks and the species is notably affected by smoke.

CHESTNUTS

In speaking of chestnuts in the United States, one is continually forced to use the past tense. Since 1904, when the chestnut bark disease was first discovered in this country, it has made such inroads on both native and cultivated trees as virtually to exterminate them in certain districts. What the final outcome will be no one can say with certainty. Some think that the American chestnut will eventually disappear from this country. Others feel that it will survive in isolated districts where the disease does not reach. Still others believe there is evidence that resistant individuals, here and there, are making a successful fight against the disease and that from these trees a more resistant species will eventually result. Whatever be the final truth of the

SENTINEL SUGAR MAPLE.
(Acer saccharum var. monumentale.)

EVERGREEN BITTERSWEET
(Euonymus radicans.)

matter, certain it is that over large areas in New York and New England the chestnut is to-day a thing of the past.

Particular interest is therefore attached to the discovery at the Garden's Extension at Gray's Summit, Missouri, of two splendid specimens of the American chestnut, *Castanea dentata* (pl. 39). They are on the recently acquired property south of the Meramec River, in a situation so isolated that the chances of their becoming infected with the bark disease are very slight. The trees were six feet high when planted by Mr. Philip Brindly, the former owner of the property, in the spring of 1894. The larger is now about thirty feet high, sixty-one inches in circumference two feet from the ground, at which height the main branches start. The total spread of branches is thirty-eight feet.

The genus Castanea (the chestnut) consists of about ten species in the temperate regions of northeastern America, Europe, northern Africa, and Asia. The American chestnut *(Castanea dentata* Borkh.), the European chestnut *(Castanea sativa* Mill.), the Japanese chestnut *(Castanea crenata* Sieb. & Zucc.), and the chinquapin *(Castanea pumila* Mill.) are extensively grown in the United States.

THE AMERICAN CHESTNUT

The American chestnut *(Castanea dentata)* is one of the largest trees of the eastern states. In general distribution it ranges from southern Maine and New Hampshire to southeastern Vermont, Ontario and southern Michigan, south to Delaware and southeastern Indiana and along the Allegheny Mountains to central Kentucky, central Tennessee, central Alabama, and Mississippi. Locally it is of rare occurrence. It attains its greatest diameter on the northern slopes of the southern Alleghenies.

The tree usually reaches a height of sixty to eighty feet, with a diameter of three to four feet, but it occasionally grows to over one hundred feet in height, with a diameter of ten feet. A tree with a diameter of seventeen feet has been recorded from Francis Cove, Kentucky. Growing in the open the chestnut is rather broader than tall, its branches

often covering an area of eighty to one hundred feet in diameter. The bark on old trunks is fibrous and deeply fissured in somewhat oblique ridges which are covered with dark brown scales. Young trunks and older branches are smoother. The twigs are stout and smooth, of a greenish to brown color, covered with numerous small, white raised lenticels. The buds are dark brown, ovate, pointed. The leaves are alternate, six to eight inches long, tapering at both ends, strong-ribbed, toothed, light green and shining above, paler beneath. The flowers are monoecious, blooming in June or July, the staminate catkins slender, four to six inches long, clustered at bases of leafy shoots, the pistillate catkins solitary or few, short-stalked, on base of staminate catkins or in the axils of the leaves. The fruit is a bur covered with numerous prickly spines and containing two to five, usually two to three, nuts which mature in September or October.

The chestnut will grow from bottomlands to mountain tops in almost any kind of soil except limestone, stiff clay, or extremely wet soil. In the North it is common on glacial drift, and in the South it remains close to mountains. It is a handsome shade and ornamental tree, with beautiful foliage. The flowers, appearing after most trees have finished blooming, are yellowish white and not individually showy but in masses they give a rich golden effect which is very striking, especially on a hillside, against the darker foliage of other trees. Later, the burs add much to the beauty of the foliage, forming tufts of light green in the summer and golden brown in the fall. The wood is pale brown, soft, light, and very durable. It is used for furniture, picture-frames, fence-posts, coffins, piling, and railroad ties.

The chestnut is comparatively free from the attack of insects. The most serious disease is the chestnut bark disease, before mentioned, commonly known as the chestnut blight. It is caused by a parasitic fungus, *Endothia parasitica*, which attacks trees of all ages and kills them by girdling them. The fungus is spread by the spores, which are sticky, and are carried by rain, insects, man, birds, and small mammals. Systematic cutting out of infested trees

CHESTNUT TREES AT GARDEN'S EXTENSION, GRAY'S SUMMIT, MISSOURI.

CHESTNUT BURS

combined with the destruction of their bark by fire has proved the only practical method of control.

The wedge-shaped brown nuts are sweet and agreeable in flavor, and are obtained in large quantities from the forests of the Appalachian region and from orchards where varieties with larger nuts are developed through selection. Propagation of species is by seeds, which should not be permitted to dry but planted as soon as mature. Varieties are propagated by grafting or sometimes by budding.

THE JAPANESE CHESTNUT

The Japanese chestnut *(Castanea crenata)* is a dwarfish tree in this country but is said to attain a height of fifty feet in Japan. The branches are slender. The buds are small, and the leaves are smaller than in other chestnuts. The nuts are large to very large, but of poorer quality. It is less subject to fungous disease than other species and is well adapted for ornamental planting.

THE CHINQUAPIN

The chinquapin *(Castanea pumila)* is a miniature chestnut. It is usually a spreading shrub but sometimes attains a height of twenty to thirty feet, with a diameter of three feet. It can be distinguished from the American chestnut by its smaller size, its whitish down on the lower side of the leaf, its smaller scurfy red buds, and smaller burs usually containing one nut. Its range is from Pennsylvania to Florida and west to Arkansas and Texas. The trees native to Arkansas and Texas are so much larger than those found in the East that some authorities believe they belong to a distinct species. The chinquapin is usually found on dry sandy slopes, rather fertile hillsides, and borders of ponds and streams. It is valuable for ornamental planting. The nuts are sold in the markets of the South.

THE EUROPEAN CHESTNUT

The European chestnut *(Castanea sativa)* closely resembles the American chestnut. The nuts are larger but not so sweet

and palatable. The leaves are more square at the base and slightly tomentose when young. This species is one of the largest of forest trees. The old Tortsworth chestnut (supposed to date back to the time of the occupation of Britain by the Romans) was fifty-two feet in circumference at five feet from the ground, in 1880. It was so large as to be called the "Great Chestnut of Tortsworth" as early as 1153. The greatest diameter of a tree has been observed in this species, of which a tree with a partly decayed trunk at the foot of Mount Etna, in Sicily, measured more than sixty feet. It was called the "Chestnut of a Hundred Horsemen," because it sheltered them all at one time. It lived to be 2000 years old. Though hollow and with its shell in five parts when measured, records show that a century before it had been a continuous cylinder. Each year these decaying stems wore a crown of green, until an eruption destroyed the tree.

The chestnut was the favorite tree of the great master of the picturesque in landscape painting, Salvator Rosa, and flourished in the mountains of Calabria where he painted. In France and Italy the nuts have been of economic value as a food for centuries.

John Evelyn, in his well-known "Sylva," published in 1664, says: "But we give that fruit to our swine in England which is amongst the delicacies of princes in other countries; and being of the larger nut is, a lusty, and masculine food for rusties at all times. The best tables in France and Italy make them a service, eating them with salt, in wine, being first rosted on the chaplet; and doubtless we might propagate their use amongst our common people, at least as being a food so cheap and lasting."

NOTES

The following students are registered in the School for Gardening for the year 1926-27: F. S. Embree, Joseph Gilmour, Emmett Layton, Walter Rist, and Eugene Waldbart.

Mrs. Francis King, of Alma, Michigan, author of articles

and books on horticultural subjects, spent a day at the Garden recently, visiting the library and plant collections.

Mr. G. H. Pring, Horticulturist to the Garden, spoke on "The Effect of Smoke upon Plants," October 27, before the Chamber of Commerce, and November 17, before the Railroad Y. M. C. A.

On the afternoon of November 12, Queen Marie of Roumania, with members of her suite and representatives of the Chamber of Commerce, visited the Garden and were received by the Director and shown the chrysanthemums.

Dr. George T. Moore, Director of the Garden, gave an illustrated talk before the Webster Groves Garden Club, November 2, at the home of Mrs. J. P. Larson, on "Flowering Trees of This Locality."

Recent visitors to the Garden include the Honorable Tsuneo Matsudaira, Japanese Ambassador to the United States; Dr. Alfred C. Kinsey, associate professor of zoology, University of Indiana; Miss Koch, graduate student in botany at Cornell University.

On several occasions during the last month a large green and yellow parrot has been observed in the Garden. One cold morning it was seen sunning itself in the bare branches of an ailanthus tree and croaking "Poor Polly" at three very much-disturbed bronze grackles.

STATISTICAL INFORMATION FOR OCTOBER, 1926

GARDEN ATTENDANCE:

Total number of visitors	23,057

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts	753
Total number of plants received in exchange	58

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	29
Total number of books and pamphlets donated	146

HERBARIUM ACCESSIONS:

By Gift—

Anderson, Dr. E.—*Iris lacustris* Nutt. from Michigan	1
Kellogg, John—*Thelephora* sp. from Missouri	1
McCurdy, Charlotte—*Lespedeza Sieboldii* Miq., cultivated specimen	1
Neal, D. C.—*Tsuga caroliniana* Engelm. from Mississippi	1
Woodson, Robert—*Cyperus aristatus* Boeckl. from Missouri	1

By Exchange—

Botanical Garden, Copenhagen, Denmark, by Prof. Carl Christensen—*Calophanes hirsutus* Oersted, photographs and fragments of the type	1
United States National Museum, Washington, D. C., by W. R. Maxon—Plants of Peru	4

By Purchase—

Merrill, G. K.—"Lichenes Exsiccati," Nos. 76-100 inclusive	25
Total	35

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the board so constituted, exclusive of certain *ex-officio* members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises about 75 acres. There is now in process of development a tract of land of over 1500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an aboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden. About 12,000 species of plants are growing in the Garden.

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset; from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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TROPICAL GARDEN, BALBOA, C. Z.

C. W. POWELL,
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Missouri Botanical Garden Bulletin

Vol. XIV DECEMBER, 1926 No. 10

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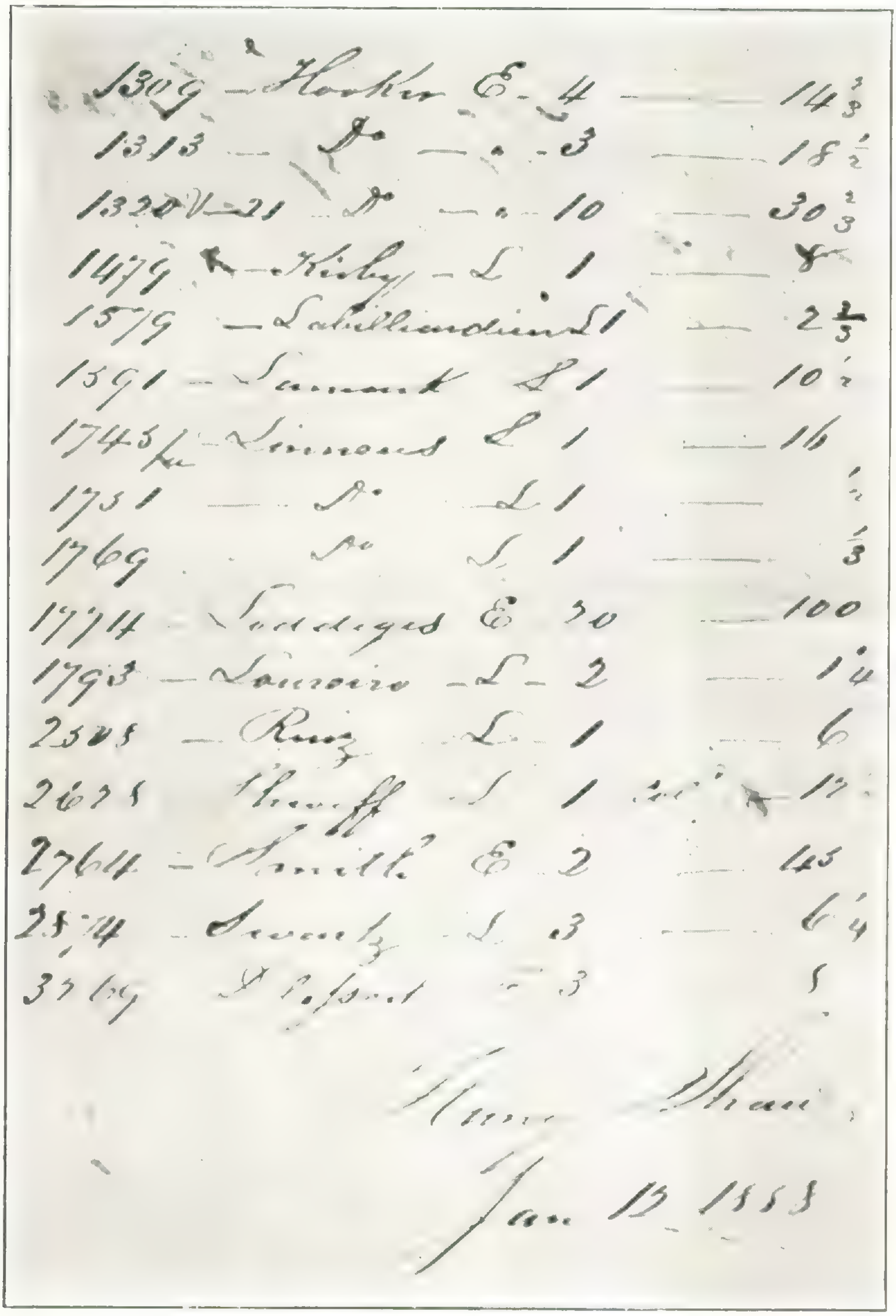

NOTE ACCOMPANYING LETTER WRITTEN BY HENRY SHAW TO DR. ENGELMANN, GIVING A LIST OF BOOKS TO BE PURCHASED.

Missouri Botanical Garden Bulletin

Vol. XIV DECEMBER, 1926 No. 10

THE IMPORTANCE OF SCIENTIFIC LIBRARIES

Were you to establish an institution for scientific investigation, what equipment would you provide? It is highly probable that unless you have had close touch with scientific work of some sort you would leave out the most essential feature, a good library. Laboratories and scientific personnel are necessary, but without a library the institution could not function.

Fundamentally important as they are, scientific libraries do not seem to catch the fancy of the public. When a popular movie shows a scientist at work it lays the scene in a laboratory. That is where most people think of him as working, amid test-tubes and microscopes; but a library scene in which he went grubbing through one volume after another would be quite as true to life. This lack of appreciation on the part of the public has had a serious effect in those institutions which are dependent on popular support. In more than one university in this country, laboratories, professorships, clerical assistance, and scientific apparatus have been provided with a lavish hand, but appropriations for scientific books have been so meagre that scientists connected with these institutions have had to pay for the necessary books out of their own pockets. Since scientific books are often expensive and the pockets of scientists are notoriously empty, investigational work in these institutions has been seriously handicapped.

Thanks to the wisdom of Mr. Shaw, the work of the Missouri Botanical Garden and the Shaw School of Botany has

never suffered from need of a library. In his will he expressly stipulated that a library of "Botany, Horticulture, and allied objects" be maintained at the Garden. He furthermore directed that certain revenues from his estate be applied to "the maintenance and increase of a botanical library and herbarium." It had been his declared intention "that scientific investigations in Botany proper, in vegetable physiology, the diseases of plants, the study of the forms of vegetable life, and of animal life injurious to vegetation, experimental investigations in horticulture, arboriculture, etc., are to be promoted." He was a well-enough informed man to know that if these intentions were to be carried out, a good library would be essential.

Perhaps a simple comparison will serve to explain just why a library is so necessary a feature of an institution like the Missouri Botanical Garden. Let us compare science to a very large and very intricate picture puzzle which is being put together bit by bit by all the scientists of the world. If each puzzler were working by himself the work would go very slowly. Men would duplicate each other's work, and no one could have any notion of the general scheme of the picture and how the sections that he had solved would fit into that scheme. On the other hand, if a bulletin were sent around from time to time, informing each puzzler of the work done by the others, these hindrances would be eliminated and new puzzlers would know where to begin working. It is in just such a way that libraries aid the scientists of the world in their investigations. When a man starts to study a particular subject, he does not have to begin at the beginning. He consults books and articles which have already been written on the subject until he has found out all that is already known. Then he proceeds with his own work, always keeping his eyes open for new articles by other workers in the same field. This relatively simple process is made more complex by the enormous number of books and journals in which the scientific work of the world has been and is being published. It is only at a large scientific library that a student will be able to find any considerable proportion of the references in which he is interested. It is no overstatement to assert that without

a good library a scientist would not know where to begin work, nor would he be able to work effectively after he had begun.

In one special field of biology the need of a library is so imperative as to merit a special discussion. This is the science of taxonomy, which deals with the naming and classifying of plants and animals. To name and classify the plants of the world, to determine where one kind leaves off and another begins, to arrange these kinds in orderly groups according to their likenesses and differences, is no small task. It has been worked at intensively for two centuries and is by no means completed.

As the work has advanced and the number of species which have been treated has increased, it has become necessary to make certain rules which are followed by all botanists in naming plants. We might compare these rules to those established for naming streets in a town. When the town was small any one who felt so inclined might name or rename one of the streets without causing serious difficulty, and might even put up his own signs at street intersections without getting into trouble. But as the town grows into a city it becomes imperative that each street have only a single established name. Rules are therefore made as to how and when a street may be named. Not all the people who live on a certain street may like the name, but in the interest of an efficient city they allow it to remain. In a similar manner, rules have been developed as to the proper fashion of naming species of plants. It very often happens that the same species is described by different botanists and given different names. Sometimes a single species may receive as many as a dozen names. By a series of regulations adopted by the botanists of the world, it is possible to decide which one of these names is the correct one to use. The adoption of these rules has brought comparative order out of very great confusion, but it necessitates an exacting amount of library work on the part of taxonomists. In any careful work on a group of plants it is necessary to look up all the descriptions of these species which have been published since the time of Linnaeus (1707-1778). It might well be imagined that this requires an un-

usually good library. There are, in point of fact, less than half a dozen libraries in the United States which are anywhere near adequately equipped for taxonomic work. It is because of its fine library, as well as its fine herbarium, that the Missouri Botanical Garden has become one of the centers of taxonomic work in this country.

THE LIBRARY OF THE MISSOURI BOTANICAL GARDEN

One of the oldest documents relating to the Missouri Botanical Garden library is shown in plate 40. It accompanied a letter written by Mr. Shaw in January, 1858, to Dr. Engelmann and has been carefully preserved among the latter's correspondence. Dr. Engelmann was in Europe and to him Mr. Shaw wrote repeatedly in regard to the institution which he was in the process of founding. He was beginning to build up a scientific library, and this hastily written note is in regard to one of his first large purchases. In the letter accompanying it he wrote:

"The list of books has my best attention—and from it I have selected 34 works, mostly such as you have scored. These will be as many as I wish to have at present, when we get the library built in 1860 we will make a more liberal purchase."

True to his word, Mr. Shaw made substantial purchases after the new building was completed, and at his death these books, with 500 given by the first director of the Garden, formed the nucleus of the present library. It was no inconsiderable legacy, consisting in round numbers of 5,000 volumes, many of them large and expensive monographs. It was somewhat deficient in the botanical and horticultural journals of the time, but large purchases of these were made later. Substantial increases have been made year by year and with numerous donations have brought the present total to around 50,000 volumes and an equal number of pamphlets. Only one of the donations has been important enough for special mention, that made by Dr. E. Lewis Sturtevant. Dr. Sturtevant, director of the first state agricultural experiment station, was particularly interested in questions pertaining to

the origin of cultivated plants. He built up from his own funds one of the largest collections in the world of early works on botany. This he voluntarily offered to the Garden in 1891, stipulating only that it be adequately protected from fire and theft. It comprised nearly 500 volumes and was accompanied by other general botanical works which were incorporated in the main library.

Many of the books and periodicals received by the Garden are sent in exchange for our own publications, the Annals and the Bulletin. As one of the recognized botanical journals of the world, the Annals is sought after by other institutions who gladly offer their own publications in exchange. This has resulted in the acquisition of one of the best American collections of publications of scientific institutions and learned societies of the world. Unlike most of the books of a popular library, these works do not decline in value as they accumulate year after year. Many of them, in fact, are to-day much more valuable than when purchased.

In these ways the library has fulfilled Sir William Hooker's prophecy to Mr. Shaw, and has continued to "increase like a rolling snow ball." At the present time it is among the best in the world for those studying plant physiology, taxonomy (plant classification), plant diseases, and biochemistry. In other horticultural and botanical fields it is well, though not so preëminently, represented. This has led, in many cases, to the inclusion of material which might not seem of a botanical nature. For instance, who would expect to find the following three books in a botanical garden library?

1. Narrative of an Expedition to the Source of the St. Peter's River, Lake Winnepeek, & under the Command of Major Long.—The journals of Long's Expedition are among many similar works in our library on the early travels and expeditions in this country. They are useful in a number of ways. It is to them we must turn when we wish to learn of the original state of the vegetation in any part of the country. Recently, for instance, an American botanist was interested in questions concerning the Illinois prairies. He believed that the climate of the state had become generally more moist in the last thousand years or so, and that when Illinois

was first settled the forests were spreading out from the river valleys on to the prairies. By going over the accounts of early travelers in Illinois he was able to obtain an impressive amount of evidence in support of his contention.

2. Journal of the American Waterworks Association.—The Journal of the American Waterworks Association is only one of several publications relating to water supply which are a necessary part of the library. Most of the organisms which contaminate water are plants, microscopic ones, it is true, but nevertheless enough like their larger and more familiar relatives to come within the field of botany.

3. Introduction to Mathematical Analysis.—The book on Mathematical Analysis is a well-thumbed copy. As botany becomes more and more an exact science, in which preeise methods are used, it becomes necessary for botanists to use standard mathematical methods in dealing with their data, and several reference books on mathematics have been added for the use of staff and students.

These three examples, chosen at random, will perhaps serve to illustrate the very diverse field covered by a good botanical library.

There are, quite naturally, several features of the library which have become especially well developed. Probably the most outstanding is the serial scientific literature which comprises over one-third of the total number of volumes. This section includes more or less complete sets of the scientific journals and publications of the learned societies of the world. The number of such periodicals is staggeringly large, how large only those who have worked in scientific libraries can realize. Many of our college and university libraries have good sets of the scientific journals, but few have as complete a representation of the publications of the scientific societies of the world, such as the Academy of Science of Paris, the Linnean Society of New South Wales, the Botanical Society of Petrograd, to mention only a few typical ones.

Probably the next most important feature is the large collection of botanical books published before the time of Linnaeus. These are mostly old herbals, strange mixtures of botany and medicine, horticulture and witchcraft. To them we

must turn when we come to the study of any question concerning the early history of cultivated plants. Most of this pre-Linnean literature is in the above-mentioned Sturtevant collection.

The number of volumes in a library is not necessarily an index to its usefulness. It is not the number of guns, but the number of telling shots that decides a battle. Similarly it is not the number of books, but the number of accessible books that determines the usefulness of a library. In this respect the Garden library is one of the best in the country. At few other large scientific libraries can the books on the shelves be so readily consulted. Recently a scientist working at another institution turned in a list of 16 books which he desired to consult. All these books were in the institution's library, but it was a day before any of them could be located and several weeks before any considerable proportion of them had been assembled. A few months later, when he came to the Missouri Botanical Garden library, this same scientist found that he could have obtained nearly all of these books within an hour's time. It may be thought that this is an extreme example, but quite the opposite is true.

While the Garden library was primarily created to serve the needs of this institution, it freely offers its services to any qualified worker. A surprisingly large number of people take advantage of the opportunity, and scarcely a week passes that the library does not offer assistance to some one from outside the Garden. These visitors come on all sorts of errands and stay for varying lengths of time. Some take a fleeting glance at a single book; others remain to work for a week or more. Within the last few weeks, for instance, the following visitors from out of town have made use of the library:

1. A fibre expert who wishes to learn more about the plants from which the fibres he studies are obtained.

2. The president of a garden club who is studying the lives of the early herb doctors.

3. A scientist who is studying the history of certain varieties of vegetables. He was particularly interested in the collection of old seed catalogues which he said was the most complete he had seen.

Not all of the people who use the library come to Saint Louis to do so. The libraries of the country have organized an exchange service by which it is possible to loan books from one library to another. Within the last twelve months, about 60 volumes have been loaned to 16 institutions outside of Saint Louis. Some of these books traveled long distances. Four went to California, one to Maine, and eight to Winnipeg, Canada. These instances are but one more illustration of the fact that the Missouri Botanical Garden is nation-wide in its usefulness.

SPRING FLOWERS IN WINTER

It is unfortunate that more people do not know the ease with which branches of spring-flowering shrubs may be brought to bloom indoors during the winter. During February and March, when anything green and growing is appreciated, they make interesting, and in some cases, very beautiful, decorations for the home.

If the best results are to be obtained certain simple precautions need to be followed. In the first place, the branches selected should be well supplied with flower buds. In most shrubs the flowers are produced only from certain specialized buds, and there is no general rule by which these may be told from the leaf buds. In some species the leaf buds are set between flower buds, while in others the reverse is the rule. Generally, the flower buds are larger and less closely appressed to the twigs. Sometimes, as in the pear and apple, they are borne on short, crooked side branches, called spurs by nurserymen. The form of the branches should be considered when selecting sprays for forcing. They will be bare, or practically so, for at least the first week, and the flowers, when they do appear, are usually smaller than those which open naturally out of doors. The branches may be of any size, however, from small twigs to six-foot sprays.

All that is needed to force the sprays is a jar of water, ordinary room temperature, and a little sunlight. Quicker results may usually be obtained if the entire branch is soaked in warm water for ten to fifteen minutes when first brought into the house.

FORSYTHIA SPRAYS BLOOMING IN WINTER.
Bare branches cut February 24, blooming indoors on March 5.

There are a large number of plants which can be brought to bloom indoors. Almost any of the spring-flowering shrubs will produce a few leaves and a flower or two, and some bloom almost as well as they do out of doors. The Cornelian cherry, *Cornus mas*, is one of the very best, as the flowers begin to appear almost at once and are fully open inside of a week. The golden-bell, or Forsythia, is almost as desirable. The flowers are larger than those of the Cornelian cherry, but they take longer to appear and wilt sooner. Other promising subjects are pear, crab-apple, sycamore (with flowers like small fuzzy, green lemons), barberry, silver-bell, and Japanese quince. Strangely enough there seems to be no absolute relation between the flowering time of the shrub and the ease with which it may be forced. The fragrant sumac (*Rhus canadensis*) and the spice bush (*Benzoin aestivale*) are both among the very earliest of our flowering shrubs, but the sumac blooms almost as soon outdoors as when forced inside, and the spice bush is very slow to open its flowers.

The branches may be brought into the house almost any time after the turn of the year, although it goes without saying that much better results are obtained by waiting until late February or early March. The following table summarizes the results of an experiment conducted by one of the pupils in the School for Gardening. The branches were all cut during the third week in February and kept in a warm, light place:

Common name	Botanical name	Number of days required to force into flower	Number of days flowers remained in bloom
Golden-bell	*Forsythia* sp.	9	7
Cornelian cherry	*Cornus mas*	8	10
Japanese barberry	*Berberis Thunbergii*	12	12
Silver-bell	*Halesia* sp.	14	7
Japanese quince	*Cydonia japonica*	14	6
Bladder-nut	*Staphylea trifolia*	10	7
Lonicera	*Lonicera fragrantissima*	3	3
Wild plum	*Prunus americana*	14	3
Chionanthus	*Chionanthus americana*	16	7

NOTES

The Society of American Florists and Ornamental Horticulturists has elected Mr. G. H. Pring, Horticulturist to the Garden, a member of the committee on school gardens for 1927.

Dr. Hermann von Schrenk, Pathologist of the Garden, spoke before the Wednesday Club, December 1, on "Termites."

Mr. G. H. Pring, Horticulturist to the Garden, spoke before the Lions Club, at Belleville, Illinois, December 9, on "Experiences of an Orchid Collector;" and before the Rotary Club, at the Hotel Statler, December 16, on "The Effect of Smoke upon Plants."

The number of birds in the Garden this winter is much larger than in recent years. A number of feeding stations have been erected at sheltered points and are being well patronized. Cardinals, juncoes, hairy and downy woodpeckers are the commonest visitors. The flock of bob-whites is particularly large and is quite tame.

Recent visitors to the Garden include Mr. Wallace Lund, of the International Education Board; Mr. H. J. Thorkelson, of the General Education Board; Dr. Ross G. Harrison, Director of the Osborn Zoological Laboratory, Yale University; Dr. D. T. MacDougal, Director of the Laboratory for Plant Physiology, Carnegie Institution, Tucson, Arizona; Prof. Naohide Yatsu, professor of biology, Tokyo Imperial University; Dr. E. M. East, professor of plant genetics, Bussey Institution of Harvard University.

Apropos of the article in the November BULLETIN on *Koelreuteria paniculata*, the following note from Mr. Benjamin W. Douglas, of Hickory Hill, Trevlac, Indiana, is of interest:

"You will probably be interested to know, if you do not know already, that this tree was planted in Indiana at a very early date.

"The New Harmony colonists used it as a shade tree and as a rule it was planted about the entrances to residences. From the use of it the name 'gate tree' became established in that community and it is still known in New Harmony by that title.

"I understand that the Chinese have a name for it that is far more fitting than any name that has been given in this country. They call it 'The Tree of the Golden Rain'—from the fact that its yellow flowers fall like rain at the end of the blooming period."

STATISTICAL INFORMATION FOR NOVEMBER, 1926

GARDEN ATTENDANCE:

Total number of visitors	32,029

PLANT ACCESSIONS:

Total number of plants and seed packets received as gifts	592

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	40
Total number of books and pamphlets donated	138

HERBARIUM ACCESSIONS:

By Gift—

Barrett, R. H.—Specimens of oak from Missouri	2
Bechtel, A. R.—Specimens of fungi from Indiana	23
Bettis, Mrs. James R.—*Rhus canadensis* Marsh. from Missouri	1
Churchill, Hon. Joseph R., by Walter Deane—Plants of Virginia	12
Dixon, Royal A.—*Magnolia tripetala* L. from Tennessee	1
Dougan, Prof. L. M.—*Carya microcarpa* Nutt. from Missouri	1
Duggar, Dr. B. M.—Plants of Texas	11
Fuller, Prof. George D.—*Phacelia sericea* Gray from Rocky Mountains	1
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Lieneman, Miss Catherine—Ferns from Missouri	2
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Ridgway, Robert—Plants of Illinois	59
Stewart, F. C.—*Polyporus cuticularis* from New York	1
Whetzel, Prof. H. H.—*Sclerotinia erythronii* Whetzel	1

By Exchange—

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Botanical Garden, Leningrad, U. S. S. R., by Prof. Boris Fedtschenko—Fragment and tracing of type	1
Stevens, F. L.—*Meliola Alstoniae* from the Philippine Islands	1
University of Wisconsin, by Dr. J. J. Davis—"Fungi Wisconsinenses exsiccati," Decades XIV-XV, Nos. 131-150	20

By Purchase—

Broadway, W. E.—Plants of Trinidad	100

By Field Work—

Overholts, Prof. L. O.—Plants of Missouri and Illinois	71
Total	428

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and, while virtually a private garden, it was, except at certain stated times, always open to the public. By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the board so constituted, exclusive of certain *ex-officio* members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises about 75 acres. There is now in process of development a tract of land of over 1500 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an aboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden. About 12,000 species of plants are growing in the Garden.

The Garden is open to the public every day in the year, except New Year's, Fourth of July, Labor Day, and Christmas—week days from 8:00 A. M. until one-half hour after sunset; Sundays from December to April, 1:00 P. M. until sunset; from April to December, 2:00 P. M. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Boulevard, on the Vandeventer Avenue car line. Transfer south from all intersecting lines.

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